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Perspective

Caring for the Soldier

Major General James B. Peake

Few callings in the Army Medical Department (AMEDD) are as honorable and worthy as caring for the individual soldier. The soldier is our prime customer and the very reason for our existence. Care and concern for our soldiers is one of the most important responsibilities we have. In this regard, the AMEDD is fully committed to all our soldiers. Our motto "To Conserve the Fighting Strength" underscores this commitment to caring.

Caring for our soldiers can take many forms. In the traditional medical sense, caring means the bedside or patient care performed by dedicated AMEDD clinicians every day. Whether it is as intense as a skillful resuscitation in the emergency department or as subtle as extending a reassuring hand to a frightened patient, this type of caring is central to the AMEDD mission.

There are other, equally important forms of caring as well. Commanders and leaders care for their soldiers everyday by ensuring a healthy climate in which to work and train. Instructors care by providing the best possible courses for their students. Noncommissioned officers care by establishing the high standards for soldiers to follow. In this fashion, the opportunity and responsibility for caring is shared by everyone in the AMEDD.

This issue of the AMEDD Journal is dedicated to the concept of caring for the soldier. The diversity of articles in this issue reflect the spectrum of approaches to caring in the AMEDD.

• *The PROFIS Physician in the Light Infantry Division* - One of the most important caring roles our medical soldiers can fill is an operational billet with a warfighting unit. PROFIS, or Professional Officer Filler System, is a mechanism whereby selected clinical personnel assigned to a fixed hospital are also assigned to a deployable unit. The authors outline their recommendations for ensuring a successful match of PROFIS physician and unit.

• *The New Generation Posterior Composite Resins: A Review of Current Literature* - Predeployment dental care has been identified as an important element of soldier readiness. Most dental emergencies in the field can be avoided with good predeployment dental care. Here, the authors review the literature on restoration materials commonly used for "fillings."

• *Improving Combat Casualty Care: Focus on the Military Medic* - The backbone of the AMEDD is the enlisted combat medic. For more than 100 years, medics have demonstrated selfless devotion to their fallen comrades. This article provides a thought - provoking view on medic training and proficiency with an eye towards future operational challenges.

• *Soldier-Teams: A Personal Viewpoint* - Looking out for your fellow soldier or "buddy" is a fundamental concept of battlefield survival and it is taught at every level of Army training. Perhaps no level of caring is more personal and stronger than between two soldiers sharing a foxhole. This article provides an intriguing look at the behavior of soldier teams in battle.

• *Handling the Wounded in a Counter- Guerilla War: The Soviet/Russian Experience in Afghanistan and Chechnya* - Operations Other Than War (OOTW) are now the most frequent type of deployment, and the AMEDD must be prepared to support these missions. Medical care of casualties of OOTW present new and unique challenges. In this article, the authors examine the former Soviet Union's experience in Asia. The lessons learned by the Soviets are eye-opening and have implication for future AMEDD missions.

• *Bugs, Drugs, and Root Canals* - Virtually all of the AMEDD's busy clinicians are familiar with sick call. While caring for our soldiers's ambulatory complaints can be routine, it is never unimportant. Every soldier deserves our undivided attention and a caring attitude on each visit. This article provides a succinct discussion of a common ambulatory complaint - toothache - and the use of antibiotics in its treatment.

• *Beliefs About Domestic Violence Among AMEDD Personnel: An Update* - Caring for our soldiers also extends to their families. This article underscores the importance of awareness of domestic violence and how it can impact our soldiers.

• *Medical Surveillance in Vietnam: Meeting the Challenge* - This article recalls the development and success of FEST teams in Vietnam. The collection of important epidemiological data behind enemy lines — helped bring control to some of the tropical diseases plaguing our forces.

As these articles demonstrate, caring for our soldiers can take many forms. All AMEDD members, clinicians, and nonclinicians alike, continue a proud tradition of caring. It has served us well and, more significantly, has served the Army's soldier well.

Handling the Wounded in a Counter-Guerrilla War:

the Soviet/Russian Experience in Afghanistan and Chechnya

LTC (Ret) Lester W. Grau†
William A. Jorgensen, DO††

Introduction

The Soviet Union intervened in the Afghanistan Civil War on Christmas Day 1979 to restore a weak and faltering communist government that was rapidly slipping out of control. The Soviets expected little resistance and apparently had no plan for staying longer than 3 years. They were there for 9 years, 1 month, and 18 days. Soviet Army medical personnel were also there for the duration, fighting disease and wounds. While they were there, they improved casualty handling and surgical support. Consequently, during the latter part of the war, they saved many lives that would have been lost earlier. They applied many of these lessons to the war in the break-away Republic of Chechnya. Many of their lessons learned can be applied to other modern forces fighting on rugged and urban terrain.

Soviet Wounded

Of the 620,000 Soviet personnel who served in Afghanistan, 14,453 were killed or died from wounds, accidents, or disease. This is 2.33% of those who served. A further 53,753 (or 8.67%) were wounded or injured.[1] In the early part of the war, there were twice as many Soviet soldiers wounded by bullets as shrapnel, but by the end of the war, there were 2.5 times more Soviet soldiers wounded by shrapnel than by bullets. The proportion of multiple and combination wounds increased four times over the course of the war while the number of serious and critical wounds increased two times. Land mines were the primary reason for this increase in serious and critical wounds. The number wounded from land mines increased by 25% to 30% over the course of the war.[2] Table 1 reflects this change.

During the early years of the war, the *mujahideen* guerrillas had rifles but few mortars and land mines. As the war progressed, the guerrillas captured or received these weapons and, consequently, the type and nature of wounds changed. Improved Soviet medical evacuation during the war allowed more critically wounded to survive. This is reflected in Table 2, which shows the number of war dead and wounded for the Soviet 40th Army by year.

Type of Wounds	1980	1981	1982	1983	1984	1985	1986	1987	1988
% Bullet	62.2	54.7	50.4	46.0	34.1	36.6	31.8	26.5	28.1
% Shrapnel	37.2	45.3	49.6	54.0	65.9	63.4	68.2	73.5	71.9
% Multiple & combination	16.0	21.1	29.5	47.6	65.4	72.8	68.8	65.8	59.4
% Serious & critical	23.1	27.7	31.1	47.1	52.4	51.4	50.2	50.1	45.2

Table 1. Type and Severity of Wounds as a Percentage of Total Hostile Fire and Mine Wounds

As Table 2 indicates, the ratio of dead to wounded improved over time from roughly 1:3 to 1:5 with a 1:3.6 ratio overall. The Russians state that the U.S. ratio of dead to wounded during the Vietnam war was

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Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Dead	86	1484	1298	1948	1446	2343	1868	1333	1215	759	53
WIA		3813	3898	6024	4219	7786	8356	7823	5008	3663	144

Table 2. Soviet 40th Army War Dead and Wounded[3]

1:5.[4] Despite the increased severity of wounds, more wounded survived. Changes in Soviet Army medical procedures apparently improved survivability.

The location of wounds was also a function of the improvement in guerrilla armaments. Table 3 shows the location of wounds and their percentage for the first and last full years of the war. The table is incomplete and the source provided general figures of upper extremities (25.4%), lower extremities (37.9%), and thoracic/abdominal wounds (1.7%) without reference to any change over time. Still, the table shows an increase in injuries consistent with shrapnel from mines over time and a decrease in wounds to the chest, stomach, and pelvis. The decrease is probably due to enforced wearing of flak jackets, plus the partial issue of improved flak jackets.

Location of Wound	1980	1988
Cranium and brain	4.9%	8.5%
Backbone and spinal cord	0.1%	0.9%
Face and jaw	1.4%	1.9%
Eyes	1.3%	3.2%
Otolaryngologic	1.8%	3.4%
Chest	11.6%	6.3%
Stomach and pelvis	7.8%	4.6%

Table 3. Location of Wounds by Percentage Over Time[5]

Table 4 shows the percentage of wounds by location for the Great Patriotic War (Soviet Union versus Germany during World War II-Soviet wounded), Vietnam (U.S. wounded), Afghanistan (Soviet wounded), and the fighting in Chechnya (Russian wounded). Differences in the percentage of wounds by location is a reflection of the type terrain that each war was fought on, the training and skill of the combatants, and the type and degree of individual protection available.

Practicing medicine in Afghanistan's rugged mountains and extreme climate provided some real challenges to Soviet medical personnel. The dry climate, high summer temperature, and impure water added to the difficulties. Serious disease hospitalized 67.09% of all Soviet soldiers in Afghanistan.[7] Soldiers died of sunstroke. Helicopters could not always reach the altitude where the troops were fighting. Soldiers who were lightly wounded high in the mountains had to be evacuated or their wounds would become serious. Soldiers who were seriously wounded while high in the mountains usually died. Since the helicopters could not reach the soldiers, the wounded had to be carried down to an altitude and area where the helicopters could land. The carrying party required security, so 13 to 15 men could be tied up in evacuating one wounded soldier.[8] Often, doctors accompanied ambush parties and patrols into the mountains.[9]

Medical Support

Soviet tables of organization and equipment (TOE) medical personnel were assigned at maneuver company level and higher. There was a medic and assistant medic at company. A physician assistant or newly commissioned doctor commanded the maneuver battalion medical section which handled initial treatment and evacuation. The regimental medical post had a medical platoon consisting of two or three doctors, a dentist, two physician assistants, a technician, a pharmacist, nurses, a cook, a radio operator, orderlies, and drivers. The regimental medical post served as a dressing station and provided

Wound site	Great Patriotic War	Vietnam	Afghanistan	Chechnya-1995
Head and Neck	19.0	21.0	15.7	24.4
Chest	9.0	5.0	12.2	8.6
Stomach	5.0	18.0	7.1	2.3
Pelvis	-	-	3.8	1.6
Arms	30.0	20.0	26.3	27.3
Legs	37.0	36.0	34.9	35.8

Table 4. Percentage of Wounds by Location in Various Wars[6]

immediate surgery, transfusions, treatment for lightly wounded, and evacuation to the division medical battalion.[10]

The basic medical service unit is the division's medical battalion. This battalion could run a field hospital which could handle up to 400 patients every 24 hours, conduct surgery, and run a 60-bed recovery facility. The battalion has three or more surgeons, a therapist, a doctor of internal medicine, an epidemiologist, and a toxicologist. The Soviet medical system was designed to treat the sick and wounded at the lowest possible level and ground evacuate the serious cases through the various echelons to where they could be effectively treated.[11]

The Soviets deployed three motorized rifle divisions (5th, 108th, 201st) and an airborne division (103d) to Afghanistan. Each of these divisions had a medical battalion. The Soviets also deployed two separate motorized rifle brigades (66th and 70th), a separate air assault brigade (56th), two separate motorized rifle regiments (191st and 860th), and a separate airborne regiment (345th) each with a medical company.[12] In addition, the Soviets deployed eight hospitals into Afghanistan and two on the Soviet-Afghan border. The 650th central military hospital (500-bed) and an infectious disease hospital (500-bed) were in Kabul. Another 500-bed infectious disease hospital was in Bagram and a 150-bed infectious disease hospital was located in Kunduz. A 200-bed infectious disease hospital for the highly contagious was located to the east in Jalalabad. A 200-bed field hospital was located in Puli-Khumri and a 175-bed field hospital was located south in Kandahar. A 300-bed hospital at Shindand served the western corridor.[13]

These extra hospitals were needed. The Soviets discovered that the number of wounded requiring intensive care was significantly higher than expected due to the increasing number of wounded who survived due to rapid evacuation to supporting hospitals. Table 5 shows the percentage of wounded requiring intensive care by type of wound. It shows that although the number of shrapnel wounds increased during the war, a significant percentage of gunshot wounds required intensive care.

A significant proportion of the wounded required emergency procedures and trauma care. Table 6 shows admission data on the percentage of those wounded admitted to emergency care or trauma units with complications requiring anesthesiology or resuscitation.

Medical Evacuation

Afghanistan was not a conventional war and Soviet medical evacuation procedures changed to meet the demands of the counter-guerrilla environment. Ground evacuation was used, but helicopter evacuation was used more frequently. The regimental medical post was often bypassed as wounded were evacuated directly from the battalion aid station to the division field hospital or one of the Army hospitals. Over the course of the war, the number of wounded treated at regimental or brigade medical posts decreased from 18% of the total to 2.5%.[16] During major Soviet

Injury	1980	1981	1982	1983	1984	1985	1986	1987	1988	Total
Gunshot wound	29.2	26.2	33.9	39.9	39.9	38.9	43.9	29.1	51.5	36.3
Other trauma	43.2	38.6	26.3	21.4	21.4	14.3	18.0	13.0	14.0	17.9
Burns	41.3	30.8	66.6	37.4	37.4	32.2	40.4	66.6	52.5	42.6
Total wounded	33.1	29.4	34.7	36.7	36.7	31.9	36.9	24.2	38.7	32.3

Table 5. Percentage of Wounded Treated in 40th Army Facilities Requiring Intensive Care by Category of Injury[14]

offensives, 90% of Soviet wounded were immediately evacuated by helicopter (74% in 1981, up to 94.4% in 1987). In 1980, 48% of the wounded were evacuated to the division field hospital or an Army hospital within 3 hours of being wounded. By 1987, this had improved to 53.1%. In 1980, an additional 33% of the wounded arrived at the division field hospital or an Army hospital within 3 to 12 hours of being wounded. By 1987, this had improved to 41.9%. In 1980, 19% of the wounded took over 12 hours to arrive at the division field hospital or an Army hospital. By 1987, this was down to 5%.[17]

Complications	Medical company or medical battalion	Garrison military hospital	Central military hospital
Shock	46.7	40.3	13.6
Loss of blood	18.1	16.9	8.3
Damage to central nervous system	10.1	8.5	6.9
Suppurative wound	4.6	6.2	19.6
Anaerobic infection	0.6	0.8	1.1
Fat embolism	1.4	1.2	0.7
Asphyxiation	1.7	1.5	0.8
Multiple system failure	---	3.2	7.5
Postoperative complications	16.8	21.4	41.5

Table 6. Percentage of Wounded with Complications Upon Admission to Emergency or Trauma Care by Type of Complication and Site of Treatment[15]

Prior to Afghanistan, the Soviet Army planned to evacuate the bulk of its sick and wounded by ground transportation. However, ground evacuation was difficult due to Afghanistan's mountainous terrain, lack of a developed road network, the likelihood of ambush along the few roads, and the long distances between regimental staging areas and medical facilities. The Soviet Army used aerial evacuation to move 68% of the wounded between 1980 to 1988 (see figure). Over 25,000 casualties were evacuated by helicopter during combat and more than 152,000 sick and wounded were moved by air during some stage of medical treatment.[18] The Mi-8MB "Bisector" medical evacuation helicopter was outfitted specifically for its medical mission, but due to limited availability, combat and transport helicopters also frequently flew wounded to hospitals.[19] The fixed-wing, propeller-driven, light medical transport AN-26M "Savior" moved sick and wounded within Afghanistan and into the Soviet Union.[20] The fixed-wing, propeller-driven, medium medical transport IL-18 "Orderly" moved sick and wounded from Afghanistan to the Soviet Union (see figure).[21,22] Patients were moved within the Soviet Union on the heavy jet military transport IL-76MD "Scalpel" or the wide-bodied TU-154 passenger jet.[23] These aircraft could be rigged to carry stretchers and provide in-flight emergency medical care.

During the first half of the war, patients were evacuated by air from several hospitals in Afghanistan to the Soviet Union, but during the second half, almost all patients were evacuated from the 650th Central Hospital in Kabul. During 1980 to 1988, Soviet aircraft transferred approximately 40,000 patients (42.1% wounded and 57.9% sick) between the various hospitals in Afghanistan. Another 78,000 patients (26% wounded) were flown to the 340th Regional Military Hospital in Tashkent, Turkestan Military District of the Soviet Union for treatment. Over 40% of the Soviet wounded were treated and recovered in the Soviet Union. Some of the wounded required specialized surgery or prosthetics. These patients were handled in specialty military hospitals in the western (European) Soviet Union. Up until 1987, these patients staged through the Tashkent hospital. From 1987, they were flown directly to these specialty hospitals from Kabul. Over 9,000 of these special-treatment cases were handled, 90% of whom required special surgery.[25]

Seriously wounded patients were evacuated from Kabul to the Soviet Union for treatment based on the severity and type of wound. Kabul hospital held 96.8% of patients with eye wounds, 78.6% of patients with neck and spinal wounds, and 74.9% of patients with brain and cranial wounds for 3 days before air evacuation. Twenty-two percent of patients with stomach wounds and 14.3% of patients with pelvic wounds were evacuated to the Soviet Union on the same day that they were wounded, while the remainder waited 5 to 7 days. One third of the patients with thoracic-abdominal wounds were evacuated within 24 hours of being wounded, while the rest waited for up to 10 days. Forty-six percent of the patients with a puncture wound to the chest were evacuated within 3 days. During these evacuation flights to the Soviet Union, 25% of the patients required intensive care while another 20% required symptomatic care. In 1987, when the IL-76 flight originated from Kabul instead of Tashkent, 9% of the severely wounded reached specialty hospitals within 5 days of being wounded and 32% reached these hospitals within 10 days. Prior to this, only 1% reached these hospitals within 5 days and 5.4% within 10 days.[26]

The Soviets experienced some problems with air evacuation. There wasn't enough room in the Mi-8MB medical evacuation helicopter and they carried outmoded Soviet medical supplies, rather than the better supplies from the west. There were not enough medical evacuation helicopters in theater, and many wounded were evacuated on the first available cargo or attack helicopter without being stabilized prior to flight. Medical aircrews were not readily available and had to be trained. Airfields didn't have the right type of retractable ladders to allow the easy loading and unloading of litters.[27]

The value of aerial evacuation is shown by a Soviet study of 318 fatalities examined by the pathologists in the morgue of the Turkmenistan Military District Hospital in Tashkent during 1986 to 1988. Their statistics show that 37.4% of the dead were evacuated by transport, attack or medical helicopter, 35.6% by armored personnel carriers, 11.6% by field ambulance, 8.2% by cargo truck, and 2.8% by fixed-wing aircraft.[28] A much higher percentage of these dead were evacuated by ground than was usual. Perhaps more of these wounded would have survived if they had been evacuated by medical helicopter.

Special Surgical Teams

The Soviets formed special surgical teams to support projected military operations. The personnel on these teams came from the central military hospital and from medical units not already supporting the upcoming operation. The chief medical officer of the 40th Army usually headed these teams which were integrated into medical battalions close to the combat zone. These teams normally consisted of three

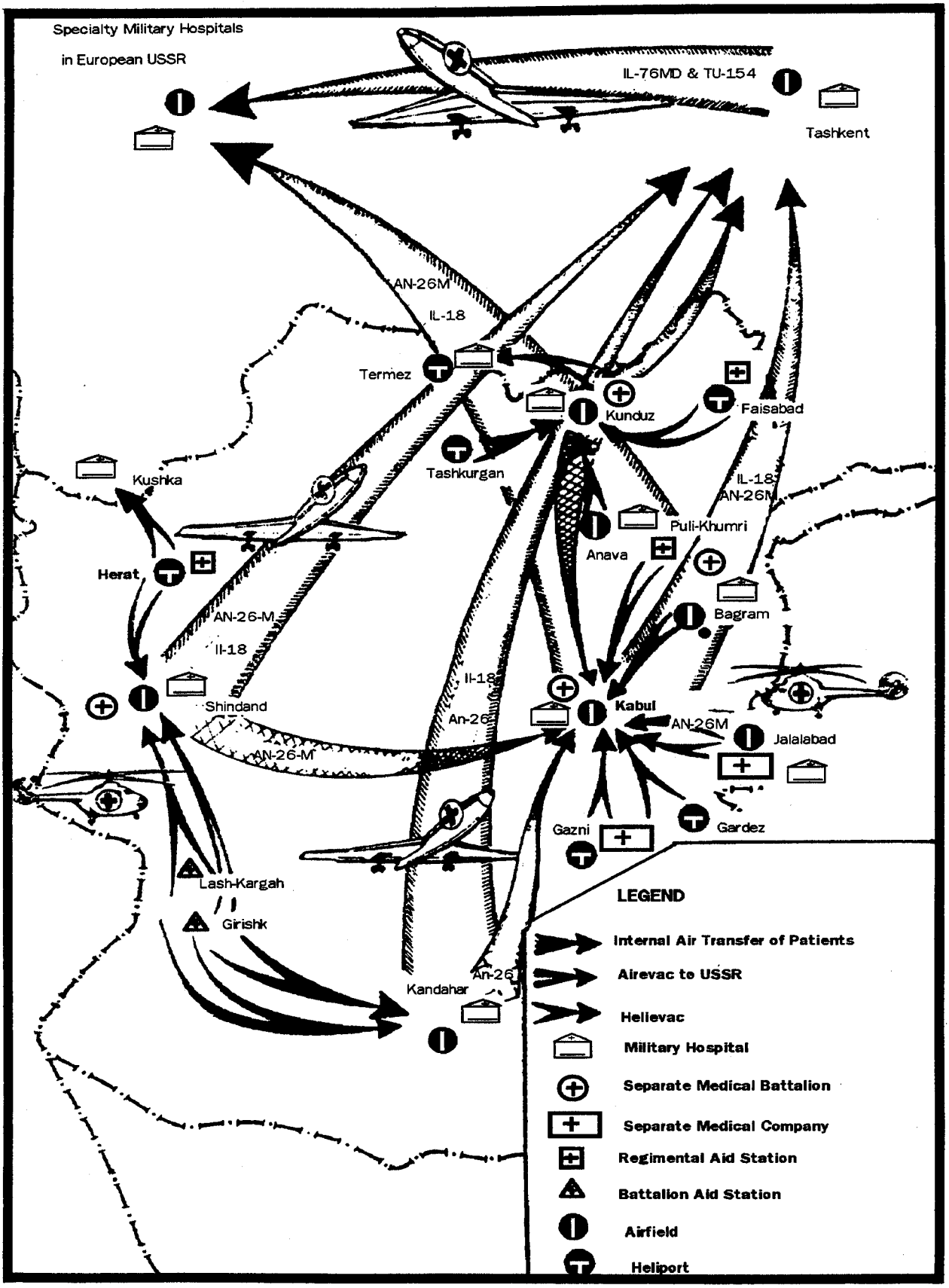

Fig. Soviet air evacuation of sick and wounded during the Afghanistan War.[24]

thoracic-abdominal surgeons, a neurosurgeon, a traumatologist, a heart surgeon, three anesthesiologists, five nurse anaesthetists, two surgical nurses, five assistant surgical nurses, and blood transfusion specialists. The senior medical officer formed the reinforced medical battalion into a triage group and a specialty surgery group which performed thoracic, abdominal, neurosurgical, trauma, vascular, and also general surgery.[29]

During these specially supported operations, 90% of the wounded received first aid within 30 minutes and 88.3% were then evacuated by helicopter to the reinforced medical battalion. This intensive medical support reduced lapsed time between being wounded and receiving qualified, specialized surgical care so that 31% of the wounded were in surgery within an hour, another 38.7% within 2 hours, another 13% within 3 hours, another 5.7% within 4 hours, and another 4% within 6 hours. This means that, 92.4% of the wounded were in surgery within 6 hours of being wounded.[30] The overall Soviet statistics for the war state that 98% of the wounded received first aid within 30 minutes, 90% were seen by a doctor within 6 hours, and 88% were in surgery within 12 hours of being wounded.[31] (The 98% figure seems very optimistic, since one of the big problems during and after combat is physically finding the wounded. And the quality of the first aid and pre-hospital care was not always the best. Autopsies disclosed that 10% of the fatalities resulted from errors in pre-hospital care with 10.6% of these errors attributed to faulty first aid.)[32] The special surgical teams and medical reinforcements cut the time of getting patients into surgery by half.

In triage, resuscitation and treatment for shock began immediately. X-rays and laboratory work was also accomplished. Depending on the severity and location of the wound, patients in triage were bandaged, treated for shock, or sent to one of the specialized surgical areas. Patients were assigned to a specialized surgical area based on their most dominant and life threatening wound. General anesthesiology was used in 70% of the operations. Analysis of the wounds treated by one of these special teams in support of an operation shows the following: individual head wounds 9.7%; individual chest wounds 3.7%; individual stomach wounds 4.5 %; individual wounds to the upper extremities 19.4%; and individual wounds to the lower extremities 36.2%. Combination wounds were 26.5% of the total of which combination wounds to the chest and stomach were 3.6%; combination wounds to the chest, stomach, and head were 6.7%; and combination wounds to the internal organs and extremities were 16.2% (these figures probably reflect the high number of wounded due to land mines). Priority for treating combination wounds was based on which was most life threatening, which were usually wounds to the stomach and head.[33]

Moving the medical support forward saved time and lives. Over the course of 2 years, the use of these special surgical teams reduced fatalities among the moderately wounded from 4.3% to 2%.[34]

Contemporary Fighting in Chechnya

Initial Russian Army performance in Chechnya was remarkably poor. Probably the best performance by any part of that Army was provided by the medical personnel who cared for the wounded. Three weeks prior to the Russian incursion, the Russian Army established and trained special emergency medical treatment detachments in each military district. Four of these deployed to Chechnya to support the maneuver units.[35]

The initial combat in Chechnya differed from the fighting in Afghanistan, since the first 2 months were spent fighting for control of the capital city of Grozny. Consequently, regiments were concentrated for city fighting, instead of dispersed throughout the countryside as in Afghanistan. The Russians in Chechnya utilized their normal evacuation system designed for conventional war and most often employed ground medical evacuation as the quickest and safest form of evacuation. Each maneuver company was reinforced with a physician assistant and each maneuver battalion had a medical doctor plus the ambulance section. Surgeons, anesthetists, and additional nurses manned the regimental medical post.[36] Wounded were normally evacuated to the regimental medical post by armored ambulance (BTR-80). Patients requiring more extensive medical care were evacuated by medical evacuation helicopter and medevac aircraft.[37] Air evacuation was not used nearly as much as in Afghanistan, particularly after the Chechens shot down several medical evacuation helicopters.

City fighting produced a different set of casualty figures. Red Cross statistics for limited conflicts usually reflect 23% wounded from mines, 26% from bullets, 46% from shrapnel, 2% from burns, and 3% miscellaneous. In the city fighting of Grozny, however, there was a higher percentage of burn wounds and the majority of wounds were caused by mortar fire. The majority of those who were killed or died from wounds were hit in the head and chest by sniper fire (particularly among the civilians who did not have flak jackets and helmets). Whereas the normal ratio

of wounded to killed is 3:1 or 4:1, this was reversed in the Grozny city fighting where three were killed for every wounded. Snipers also presented a problem for medical evacuation and frequently the wounded could not be evacuated until nightfall.[38]

Conclusions

Soviet and Russian medical doctors emphasized the following points when discussing Soviet wounded and medical evacuation procedures in Afghanistan:

- As guerrillas became better armed, the proportion of gunshot to fragment wounds changed with mines becoming one of the more serious threats to the force.

- Mines and shrapnel produced multiple and combination wounds which were more difficult to treat.

- Shock and loss of blood were significant complications in treatment of wounded.

- Air evacuation is the preferred method of evacuation in counter-guerrilla wars. In counter-guerrilla wars, the distance to supporting medical units increases, the evacuation route is subject to ambush, and the terrain usually slows down ground evacuation.

- Preparation for medical air evacuation needs to start in peacetime. Additional, better-designed and equipped Mi-8 medical evacuation helicopters are needed. The AN-72 twin-turbofan short take off and landing light transport aircraft needs to be put into service as a medical evacuation asset and stationed in every military district.[39] The TOE slots need to be established for medical aircrew, so that they are trained and ready to deploy immediately when needed.[40]

- The medical company located with maneuver regiments and brigades needs to be taken out of the medical evacuation process in counter-guerrilla war. Wounded need to be evacuated directly from the field to a hospital with no intermediate station other than the battalion medical section which stops the bleeding, treats for shock, and coordinates the air evacuation.[41] Presumably, the medical companies would still handle sick, who are a major problem in counter-guerrilla war.

- Special surgical teams need to be set up prior to the start of any major military operation and located as far forward as possible.

Preliminary Russian lessons from the city fighting in Chechnya emphasize the following points:

- Medical points need to be located close to the fighting to provide prompt, lifesaving care to the wounded.

- Ground evacuation using armored ambulances is normally best when units are concentrated in a constricted area.

- Maneuver units need medical reinforcement, both within the units and as augmentation to the normal field medical units.

- Burns, shrapnel wounds, and sniper wounds are far more common in city fighting. Snipers produce a high percentage of head and neck wounds.

- Medical units directly supporting units fighting in a city need to be protected and dug in. When possible, the entire hospital should be underground in basements connected by trenches.

From the authors' perspective, the Soviets needed to do a better job on first aid and initial emergency field surgery. The wounded needed to be stabilized prior to medical evacuation. Air evacuation should have been on specially-equipped medical evacuation helicopters with on-board medical personnel. The evacuation plan and preparation for commitment of medical teams will vary depending on the type of combat, terrain, and climate. In Bosnia, wounded and injured Russian soldiers are currently treated in U.S. medical facilities. In a future, larger-scale combined operation involving Russian and U.S. forces, medical support issues will have to be worked out in advance. Although there are similarities in U.S. and Russian medical evacuation procedures, there are enough differences in the two medical systems to justify deploying medical support packages from both sides and letting each side treat its own wounded. This has been shown time and again, even within the United States Armed Forces when Army, Air Force, and Navy wounded are treated by another branch.

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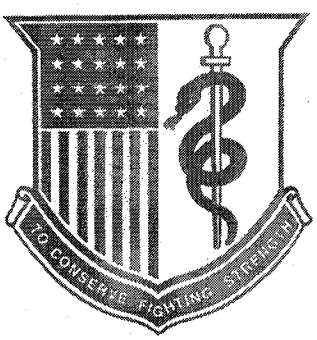

Beliefs About Domestic Violence Among AMEDD Personnel: An Update

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Introduction

Domestic violence continues to claim a substantial number of victims in the United States each year. Among them are significant numbers of military family members. Almost 6,400 Army spouses are abused annually.[1] In response to this societal tragedy, the Army developed and implemented a comprehensive family advocacy program (FAP). Although prevention and education are critical components of the program, clinical intervention by the Army Medical Department (AMEDD) multidisciplinary healthcare team becomes the essential ingredient needed to interrupt the cycle of violence. The medical team's effectiveness in accomplishing this task is in many ways dependent upon the individual members' attitudes about domestic violence. Hamlin and colleagues, recognizing the relationship between attitudes and behavior, surveyed AMEDD personnel in 1988 to identify commonly held beliefs about domestic violence.[2] Their study suggested that healthcare providers would benefit from additional information on identifying and intervening in spouse abuse. Now 9 years later, one wonders how almost a decade of public health initiatives, community awareness, and high profile cases of domestic violence have shaped the attitudes and beliefs of today's Army healthcare team? This follow-up study, utilizing methods consistent with Hamlin's original research, was undertaken to answer that question.

Literature Review

A number of commonly held beliefs and attitudes exist among today's healthcare professionals. King and Ryan report that the most prominently held beliefs about spouse abuse include conceptualizing family violence as a private matter, believing that abuse cannot be that terrible or the victim would leave, thinking that people who live in abusive relationships become helpless, identifying alcohol as a cause of abuse, and associating abuse with certain racial and cultural groups.[3] Shipley and Sylvester, Army Nurse Corps officers, reported on professionals' attitudes toward violence in close relationships.[4] Although their findings were limited by a low return rate (27%), they reported that a majority of healthcare providers agreed that financial worries, mental disturbances, aggressive personalities, exposure to childhood abuse, unrealistic role expectations, and substance abuse contribute to domestic violence. Furthermore, they found that 80% of their sample supported a legal mandate for healthcare providers to report spouse abuse.

In an ethnographic study of primary care physicians, Sugg and Inui explored how experiences with and attitudes about domestic violence may create barriers to effective intervention.[5] Thirty-eight semistructured, open-ended interviews revealed a number of potential issues in working with domestic violence victims in a primary care setting. The greatest concern cited by the physicians was the belief that inquiring about spouse abuse could eventually consume more of their scarce time than they had to spare in an already tight schedule. Many believed that broaching the subject might offend the patient. Half of the respondents expressed frustration and a sense of powerlessness when describing their inability to "fix it." Many admitted to being more likely to ask patients from lower socioeconomic backgrounds about abuse. This likelihood was in contrast to their intellectual acknowledgment that domestic violence cuts across all races, classes, and ethnic groups. In a related area of family violence, Trute and colleagues surveyed workers' attitudes regarding treatment and punishment of incest.[6] A small but statistically significant difference between police, child welfare, and community mental health professionals emerged from the findings. Although the three groups each tended to support a general treatment orientation in service delivery for families experiencing incest, as one would expect, law enforcement personnel tended

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to view punishment as a more effective deterrent to incest. A study of nursing students' attitudes toward victims of domestic violence, conducted by Coleman and Stith, revealed that sex-role attitudes appear to be a good predictor of attitudes toward domestic violence victims.[7] More specifically, they discovered that people who were more egalitarian in their sex-role beliefs expressed higher levels of sympathy for victims of domestic violence.

In a review of ethical considerations of physicians and domestic violence, the American Medical Association's (AMA) Council on Ethical and Judicial Affairs identified a number of societal misconceptions that undermine the healthcare system's response to family violence.[8] Foremost among these is the belief that battering only occurs in certain racial and socioeconomic groups. Consistent with other reports, the Council expressed concern that viewing domestic violence as a private matter which should be resolved within the relationship may create a reluctance to inquire about spouse abuse. Moreover, victims may be improperly held responsible for the violence because of their refusal to leave an abusive partner. They concluded that physicians have a duty to become aware of misconceptions about domestic violence and prevent these from affecting diagnosis and management of abuse. In a similar report, the Council on Scientific Affairs of the AMA recommended that since at least 20% of women seen in emergency rooms present with symptoms related to abuse, physicians should actively find solutions to the violence by incorporating routine assessment questions, sensitive responses to disclosure, and effective referral sources into their standard operating procedures.[9]

A nonscientific but extensive survey of over 300 adolescents reported on the Internet may offer a glimpse into the future of domestic violence.[10] Fifty-six percent of the students surveyed said they knew someone who was involved in an abusive relationship and 35% reported witnessing abusive behavior by a parent or another adult they knew well. Perhaps most telling of all, 22% stated that they believe there are times when violence in a relationship is justified.

Research Methodology

This update of Hamlin and colleagues' exploratory study utilized a similar cross-sectional research design. The Domestic Violence Survey instrument, described in the original report, was shortened and edited by incorporating current terminology with the assistance of the Evaluation and Standardization Branch from the Department of Academic Support at the Army Medical Department Center and School (AMEDDC&S). The instrument's first section concentrates on demographic information from each participant. The second section contains 62 Likert-scaled questions designed to gauge an individual's beliefs and attitudes about domestic violence.

A total of 403 AMEDD personnel participated in this survey conducted at the AMEDDC&S during June and July 1997. Consistent with the first survey, respondents represented a wide range of enlisted and officer medical occupational specialties. The sample was selected by surveying attendees at three resident courses. Thirty-one participants were attending the Advanced Noncommissioned Officers Course (ANCOC), 90 were from the Officer Advanced Course (OAC), and 282 were attending the Officer Basic Course (OBC). While the total number of participants is comparable to the 418 included in the original study, the numbers in each individual course differ vastly. There are far fewer participants from the OAC and ANCOC groups but substantially more from the OBC. The differences most likely reflect the outcome of current force structure initiatives.

Most of the OAC and ANCOC attendees have at least 10 years of military service. Attendance at these advanced courses requires a proficiency in understanding, planning, and delivering combat service support operations at the command and staff levels. The OBC consists of students who are new accessions to the AMEDD. This course introduces medical professionals to military operations, policies, and leadership principles in order to facilitate a transition into a military practice setting. It is significant to note that a substantial percentage (42) of the OBC students had over 2 years of prior military service.

Data collection was coordinated with personnel from the Department of Healthcare Operations and the Noncommissioned Officers (NCO) Academy and fully supported by the Dean, Academy of Health Sciences. To ensure that survey administration did not conflict with training, each course was surveyed separately during the student orientation period. Respondents were assured that their responses would be anonymous and no distinguishing information was collected. Participation was voluntary but they were encouraged to complete the instrument. Data analysis was completed with assistance from the Department of Academic Support.

The findings derived from this research should be considered within the limitations inherent in survey

methodology. It was assumed that the personnel attending the three courses at the time of the data collection are representative of their peer groups. Respondent error in interpreting questions and possible patterning of responses are characteristic of self-report instruments.

Findings

Description of Respondent Groups.

• *OAC (n = 90)* - The vast majority (72%) of officers in the advanced course were between 27 and 36 years old. Fourteen percent were between 37 and 41 years old. The group was comprised of 69% male and 31% female. Seventy-five percent were married. Sixty-six percent identified themselves as Caucasian with 11% African-Americans, 9% Asian-Americans, and 5% Hispanics. As one would expect at this level of military training, 43% had earned a graduate or professional degree and 98% held at least a bachelors degree. Thirty-five percent reported experiencing domestic violence within their families. However, 47% had friends who experienced domestic violence. Twenty-eight percent had received no training in domestic violence.

• *OBC (n = 282)* - A large majority (77%) of the OBC students were between 22 and 31 years old. Eleven percent were in their mid-30s and 6% were under 21 years old. Sixty-nine percent were male and 31% female. Less than half (47%) were married. Caucasians made up 71% of the group. Minorities: African-Americans (9%), Hispanics (7%), and Asian-Americans (6%), comprised the remainder of the class. Everyone was a college graduate with 47% earning a masters or professional degree. Thirty-four percent had experienced domestic violence in their own families and 44% knew friends who had experienced domestic violence. Twenty-seven percent had not participated in domestic violence training.

• *ANCOC (n = 31)* – Over three quarters (77%) of these NCOs were between 32 and 41 years old. A small number (10%) were between 27 and 31. The class consisted of 70% male and 30% female. Most (77%) were married. Thirty-nine percent identified themselves as Caucasian, whereas 32% were African-American, and 13% were Hispanic. Half of the respondents (50%) had completed 2 years or less of college while 25% had earned a bachelors degree. Forty percent had some experience with domestic violence in their own families. Well over half (63%) had friends who were involved in domestic violence. Over three-quarters (80%) had received some training in domestic violence.

Beliefs About Domestic Violence.

• *OAC* – Almost three-fourths (71%) of advanced course officers believe that domestic violence cannot be kept a private problem because of the harm it causes. Moreover, the vast majority (84%) believe that injuring a spouse so badly that medical care is needed is not only domestic violence but also a criminal act. Being verbally abusive, destroying self-confidence, and continually humiliating someone is believed by 64% of the respondents to be domestic violence but not typically a crime. The majority (57%) reported believing that domestic violence is likely to occur equally across all income and educational levels. Nonetheless, a sizable minority, about one-fifth, think it is most likely to occur in low income, poorly educated families. The most frequently selected factors believed to contribute to spouse abuse identified by this group were: the abuser has a poor self-image or is insecure (24%), the abuser was raised in a violent family (20%), and stress (18%). Sixty-three percent view people with a drinking problem as being more likely to be violent. In contrast, only 11% think that people with strong religious connections are likely to perpetrate violence. Two-thirds (66%) believe that an abused spouse remains with an abuser because of a complex combination of reasons to include fear of further violence, having nowhere else to go because of financial or family circumstances, desiring to keep the family together, and hoping the abuser will change. Importantly, children who witness violence in the home are believed by a large majority (81%) to likely be harmed by the experience.

• *OBC* – The overwhelming majority of the OBC students (78%) do not view domestic violence as a private problem. Furthermore, 94% believe that harming someone so badly that medical treatment is needed is both domestic violence and a crime. Verbal abuse, humiliation, and destroying self-confidence is considered domestic violence but not a crime by two-thirds (66%) of the class. Most (54%) believe that spouse abuse occurs equally across all income and educational levels. However, 32% think it is most likely to happen in low income, poorly educated families. The most frequently cited factors believed by this group to contribute to abuse were: the abuser has a poor self-image or is insecure (32%), the abuser was raised in a violent family (29%), stress (13%), and the abuser is mentally disturbed (12%). Over three-quarters (79%) think that people with a drinking problem are likely to be violent but only 9% believe that religious people are likely to be violent. Seventy-two percent recognize that victims stay in abusive relationships because of a combination of reasons to include fear of further violence, having nowhere else

to go, and thinking the abuser will change. Children who witness domestic violence are believed by almost the entire group (95%) to be harmed by the experience.

• *ANCOC* - Seventy-four percent of this ANCOC class believe that domestic violence should not be kept as a private problem. Almost three-fourths (71%) identify injuring someone so badly that medical care is needed as both domestic violence and a crime. Close to half (45%) define being verbally abusive, humiliating, and destroying self-confidence as domestic violence but not criminal behavior. Two-thirds (65%) report that abuse most likely occurs equally across all income and educational levels. Only 10% believe that abuse is more prevalent in low income groups and fewer still (3%) think it most likely occurs in poorly educated families. The most often identified factors believed to contribute to abuse are: the abuser was raised in a violent family (26%), stress (23%), and the abuser has a poor self-image or is insecure (23%). Alcohol abuse is seen as increasing the likelihood of domestic violence by almost half (42%) while a person being religious is viewed as being associated with violence by only 10%. A full two-thirds (68%) believe that a victim stays when beaten because of a combination of reasons to include having no place to go because of a lack of financial resources or family circumstances, and hoping that the abuser will change. The overwhelming majority (74%) agree that children who witness violence are harmed by the experience. A summary of key beliefs reported by the three groups is provided in the table.

Responding to Domestic Violence.

• *OAC* – Slightly over half (51%) believe that spouse abuse perpetrated by male soldiers is a common problem in the military community. Conversely, only a quarter (24%) perceive abuse by female soldiers to be a common occurrence. In response to abuse, 20% of advanced course students view strict enforcement of laws or regulations as usually or almost always effective in curbing domestic violence. There is an increase (29%) when counseling is included along with regulatory enforcement. The need for domestic violence treatment programs in the Army is assessed as being very great by 43% and nearly two-thirds (64%) recognize that the Army FAP always requires reporting abusive incidents. Moreover, 56% believe that incidents of spouse abuse should be referred to both the FAP and the military police (MP). If a soldier is arrested for injuring their spouse, two-thirds (67%) think the soldier should be court martialed. Only 13% would choose a command referral for counseling as the primary consequence for spouse abuse.

• *OBC* – Fifty-three percent describe spouse abuse by male soldiers as being a common problem in the military. However, only 20% believe that abuse perpetrated by female soldiers is common. Strict enforcement of spouse abuse laws or regulations is seen to be an effective response to domestic violence by 12% of OBC students. Counseling, coupled with regulatory enforcement, is thought to be effective by an additional 14% for a total of 26%. Fifty-six percent

Percent who believe that ...	**OAC**	**OBC**	**ANCOC**
Violence is not a private problem	71%	78%	74%
Injuring someone so they need medical care is domestic violence and a crime	84%	94%	71%
Domestic violence occurs equally across all socioeconomic levels	57%	54%	65%
Abusers have a poor self-image or feels insecure	24%	32%	23%
Being raised in violent family causes abusive behavior	20%	29%	26%
Stress causes abuse	18%	13%	23%
Alcohol abuse is associated with spouse abuse	63%	79%	42%
Children are harmed by witnessing abuse	81%	95%	74%

Beliefs About Domestic Violence

identified a very great need for Army treatment programs for abuse. Moreover, 52% know that the FAP always requires reporting instances of abuse. Additionally, 69% believe that abusive incidents should be referred to both the FAP and the MPs. A sizable majority (61%) would recommend court martialing a soldier arrested for injuring their spouse whereas only 16% would rely on a command referral for counseling as the primary consequence for abuse.

• *ANCOC* – Almost half (45%) of the NCOs believe that spouse abuse inflicted by male soldiers is common. On the other hand, only 29% believe that female soldiers commonly abuse their husbands. Few, (10%), think that strict law or regulatory enforcement is usually an effective response to abuse. A quarter (25%) believe that a combined approach of counseling and regulatory enforcement is usually or almost always effective. Close to half (42%) see a very great need for spouse abuse treatment programs in the Army. Well over half (55%) acknowledge that FAP always requires reporting of abuse. Sixty-five percent believe abusive incidents should be referred to both the FAP and the MPs. Nonetheless, only 29% believe that soldiers arrested for injuring his or her spouse should be court martialed. A command referral for counseling is the preferred consequence for abuse by 36% of the NCOs.

Discussion

The results suggest, consistent with those found by Hamlin et al almost 10 years ago, that there is much similarity in the belief systems held by AMEDD personnel in the way they view domestic violence. Each of the participant groups tend to define spouse abuse as a problem which cannot be allowed to remain private because of the harm it causes to others. There appears to be wide spread agreement that children who witness domestic violence are harmed in some way by the experience. Also, most generally believe that alcohol abuse typically coexists with spouse abuse. Likewise, growing-up in a violent family, which probably contributes to the development of a poor self-image and sense of insecurity, is widely thought to cause abusive behavior. The AMEDD personnel, at least those surveyed here, recognize that the decision to stay in an abusive relationship is based on a complex combination of factors. Many identify circumstances such as fear of further violence, financial limitations, and family concerns which may indicate an underlying belief that abused spouses may feel trapped by the experience. About half of all respondents think that spouse abuse is a common problem in the military and therefore, a need for domestic violence treatment programs exists in the Army. While most of the officers and NCOs recognize a need to report abuse, it is somewhat alarming that a sizable portion of each group did not acknowledge the regulatory mandate to do so.

Although there is substantial similarity in the thinking of the three groups, there are some notable divergences. When compared to OAC and OBC students, the NCOs were less likely to believe that abuse occurs more frequently in low income, poorly educated families. Additionally, ANCOC personnel favor a more tempered response to abuse which includes command referrals to domestic violence treatment programs, whereas, the officers tended to recommend stronger consequences to include court martial for abusive behavior. Another noteworthy difference in beliefs about domestic violence is that OBC students are more likely to view abusers as mentally disturbed. Perhaps some of the differences discussed here can be attributed to demographic variances but extraneous variables were not controlled during data analysis.

Some interesting observations emerge when the results of the current survey are compared to those reported earlier. It is a welcome discovery that AMEDD personnel continue to overwhelmingly believe that spouse abuse is not a private problem. This finding suggests long-standing support from within the AMEDD for intervening in abusive families. Part of this support may be rooted in the sustained belief that children are adversely affected by witnessing domestic violence. Moreover, since most reported believing that growing up in an abusive home contributes to becoming an abuser, intervening early to stop family violence can be viewed as an effective method for interrupting the transgenerational transmission of spousal abuse.

The AMEDD personnel today, as represented by the survey sample, vary in some important ways from their predecessors. Most noteworthy is that the current group of NCOs apparently no longer believe that low income, poorly educated families are more likely to experience domestic violence. This modification in thinking may be a reflection of the increased exposure to spouse abuse training reported by the 1997 ANCOC attendees. Similarly, a larger percentage of OBC students reported having at least some training in domestic violence. This could indicate that civilian training programs have included additional courses in family violence, or on the other hand, the increase in training could be the result of the relatively large number of OBC students with prior military service. However, the available data did not allow for assessing specific causality. Although the total number who reported not knowing of the requirement to report

abuse remains too high, the number does represent a decrease from 1988. Thus, it appears that awareness of the Army's FAP may be growing.

Implications for Practice

Although one should be careful not to overstate the applicability of findings derived from descriptive data, the results discussed in this survey do provide information which may be useful in developing an effective, healthcare response to domestic violence. There is some evidence presented here that suggest training and education may help shape beliefs and attitudes regarding abuse. The 1988 survey reported that there was a tendency for all groups to associate domestic violence with low income and poorly educated families. The present ANCOC group has changed their perspective. While it could be coincidental, the reported modifications in the ANCOC group's beliefs about domestic violence and socioeconomic status may be related to the increase in training they have received in spouse abuse.

Perhaps the most significant implication embedded in the results of this survey reside in the "blind-spot" some personnel have in identifying victims of domestic violence. A number of AMEDD officers seem to believe that abuse victims are more likely to come from low income, poorly educated families. For the military, this can be translated into a family with a sponsor from the lower enlisted ranks. The danger may exist that victims who do not fit a preconceived profile might be missed. Increasing awareness that abuse does cut across all socioeconomic levels could help to capitalize on the apparent desire of most AMEDD personnel to intervene to alleviate abusive situations.

Conclusion

Domestic violence appears to be an intractable social-ill which will require a concerted response from healthcare providers for the foreseeable future. The effectiveness of the medical efforts to ameliorate family violence can be enhanced through heightening the awareness of how personal beliefs, whether based on fact or misconceptions, can influence the quality of care delivered by the healthcare system. Combining self-awareness with a sustained commitment to pursue training in the identification and response to spousal abuse ensures the continued development of comprehensive and sensitive interventions on behalf of the victims of domestic violence.

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The New Generation Posterior Composite Resins: A Review of Current Literature

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Introduction

With the continued revolution in esthetic dental materials, the general practitioner is at a loss to keep up with the changes in posterior composite resins. Increased public demand for esthetics, the advent of adhesive dentistry, and a fear of "mercury toxicity" from previously placed amalgam has many dentists scrambling for up-to-date information on products, their properties, and techniques for placement.

The first composite resins were developed almost 30 years ago, and consisted of a BIS-GMA resin and a quartz filler. Initially, there was rapid acceptance by the profession. However, upon further study, researchers found several factors that made these new restorations inferior for clinical use. The principle reason for their failure was an extensive degree of wear and loss of anatomical form after 2 or more years.[1] They also exhibited a high incidence of microleakage, recurrent caries, difficulty in obtaining suitable proximal contact with adjacent teeth, isthmus fracture, postoperative sensitivity, and a lack of radiopacity.[2] Subsequently, it was recommended that composites be eliminated as a material for use in restoration of Class I and II caries.[1]

Despite their initial results, efforts continued in the following years to improve composite resins and spark interest in their use as posterior restorations. In spite of their popularity, however, their indications and limitations for use as posterior restorative materials are not well-known; and this has led to inappropriate clinical applications in many cases. This article reviews the current literature on the new generation posterior composite resins and discusses their advantages and disadvantages, physical and mechanical properties, and indications for use.

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ADA Requirements

For a posterior composite to receive provisional acceptance from the American Dental Association (ADA), it must meet safety and effectiveness requirements. In 1981, the Council on Dental Materials established guidelines for the Acceptance Program for Occlusal Class I and II restorations.[3] From these studies, a posterior composite resin must demonstrate the following:

- Color matching - no more than 10% of the restorations showing obvious mismatch
- Interfacial staining - no more than 10% of the restoration showing deep penetration of stains
- Anatomic form - no more than 150μm mean wear (loss of material)
- Interproximal contour - no more than 5% of the restoration showing loss of contour
- Information on the safety of the composite resin determined through animal tests
- Occurrence, if any, of recurrent caries during the 3-year study
- For primary teeth, 2-year studies may be considered for provisional acceptance

The provisional acceptance is given for a total of three 1-year periods, and a product may be reevaluated at any time for possible change of classification to "Acceptable." For a composite to be fully acceptable, it must have a minimum of two clinical studies of 5-year duration showing safety and effectiveness.[3]

Advantages and Disadvantages

In looking at desirable qualities, an ideal posterior filling material should possess the following properties:[4]

- Esthetics

- High resistance to clinical wear

- Permanent marginal integrity

- Minimal cavity preparation

- Provision of a sealing bond and a retentive bond to tooth structure

- Nonbrittle material with adequate tensile and compressive strength

- Radiopacity

- Self-bonding properties should additional restoration become necessary

- Ease of manipulation

- Nontoxicity

- Resistance to formation of secondary caries

- Minimal galvanic and thermal shock properties

Beyond them being an esthetically attractive restoration, composite resin have many advantages. Some of these include elimination of galvanic current and absence of the controversial mercury hazard, low thermal conductivity, conservative preparation and adhesive bonding, and enhanced fracture resistance.[5] However, posterior composites also suffer from some shortcomings such as poor wear resistance, microleakage, postoperative sensitivity, thermal expansion, polymerization shrinkage, technique sensitivity, longevity, and potential irritation to the pulp.[3-5]

Properties

Galvanism and Mercury Toxicity. With the airing of the report on dental amalgam by CBS-TV's "60 minutes," the subject of mercury toxicity was once again thrust into the forefront of consumer concern. Composite resins do eliminate the concern of mercury toxicity and galvanism often associated with amalgam.[5] However, upon further investigation, there seems to be no evidence in the scientific literature that the minute amounts of mercury vapor that may be released from amalgam restoration cause mercury poisoning. The ADA council on Dental Materials, Instruments, and Equipment states that, under normal conditions, mercury toxicity from amalgam is not likely to be a hazard; and goes on to say that the use of mercury in the dental environment continues to have a good overall safety record.[5] Also, sufficient data is not available to endorse replacement of silver amalgam with Class II resins to correct any alleged bioincompatibilty.[6]

Thermal Conductivity. With the use of composite resins for posterior restorations, the thermal conductivity often seen with amalgam is virtually eliminated. However, liners are still recommended for pulpal protection from unpolimerized resins and acid used in etching.[7]

Conservative Preparation and Adhesive Properties. Another advantage of posterior composite resins is the conservation of tooth structure and the use of acid etch/bonding techniques. In amalgam restorations, the preparations are designed to use undercuts and dovetails for retention. With the virtual simultaneous development of the acid etch theory and the composite resin systems, preparation can now be limited "to the removal of carious tissue and friable enamel."[4] Therefore, when the decay does not extend into pits and fissures or dentin, the preparation does not need to involve these areas because adequate retention can be achieved through acid etch/resin bonding with the enamel. However, unlike amalgam restorations whose margins are "self-sealed" by corrosion product formation, if a satisfactory bond is not achieved at the composite resin/enamel interface, marginal leakage can occur.

Fracture Resistance. When a tooth is involved with caries or subjected to cavity preparation, it becomes more susceptible to cracking or cuspal fracture. Research indicates that teeth restored with composite resins regain much of their strength and resistance to cuspal fracture through bonding of the tooth structure with the resins.[8] In addition, some research has shown that teeth restored with composite were significantly stronger than either unrestored prepared teeth or teeth restored with amalgam.[9] This study also suggests that composite could be used in a transitional role in posterior teeth after endodontic therapy. However, at the present time, no objective research has shown any of these materials to be capable of significantly resisting polymerization contraction and microleakage, especially below the cemento-enamel junction.

Wear. One of the disadvantages of early composite resins was their poor wear resistance. These composites such as *Adaptic* (Johnson and Johnson Dental Products) and *Concise* (3M®) exhibited a wear rate of 100 to 150 μm per year.[7] Their poor wear was due to several factors: (1) Wear and chemical degradation of the resin matrix, resulting in loss of the filler particle through cracks and cohesive failure of its bond to matrix. (2) Failure of the particles to bond to the matrix, partly due to attack by H_20 on the

silane coupling agent present within the filler. (3) Microcracks in areas of stress concentration caused by occlusal forces and tensile stresses between matrix and filler. (4) Microcracks around protruding unworn filler particles. (5) Exposure of entrapped air bubbles (porosity in the material).[8]

Improvements in Wear Resistance

These findings, among others, led to the development of new composites that addressed the issue of wear. These improvements have been achieved through changes in the particle size and composition, filler content, and method of polymerization.[8] Most posterior composites are commonly categorized according to their filler characteristics and can be placed into four categories according to the size of their filler:[10]

- Large particle composites (*Adaptic, Concise*) have particle sizes of 8 to 150 μm with an average size of 30 to 50 μm. Recently, these composites have changed to a particle size of less than 10 μm.

- Intermediate-particle composites (*Fulfil, Occlusin*) have glass particles of 1 to 5 μm in size and also many contain small amounts of silica to improve condensability.

- Fine-particle composites (*Herculite XR*) contain particles ranging from 0.5 to 1.0 μm.

- Microfilled composites (*Heliomolar*) are composed of particles ranging in size from 0.04 to 0.06 μm.

One additional group of composite resins may be classified according to a particular size. Called "blends" or "hybrids," they contain a mixture of microfill and small/large particles. Since almost all composites on the market contain a varying percentage of microfill particles, only those that have a total microfill amount of 15% to 20% can be classified as true hybrids.

In addition to the change in size of filler particles, the amount of filler loaded into the resin matrix has been altered. Most posterior composite resins currently marketed have increased their filler loading to 50% to 80% by volume. Some manufactures cite the filler content by weight percent, but this can be misleading because the density of the various filler particles can vary. Research now has shown that by decreasing the particle size and increasing the number of particles per unit volume, stress on each particle (both occlusally and interproximally) is reduced substantially, resulting in an overall reduction in loss of anatomic form.[11]

In addition to using smaller filler particles and increasing their concentration, particle composition has been changed. Many manufacturers have opted to reduce the hardness of the particles resulting in composite resins substantially more wear resistant.[11] In the early composite resins, a hard quartz filler particle was used, but now a softer particle such as barium, strontium glass, or lithium aluminum silicate has been substituted.[8,11] Initially, when the quartz filler particles were embedded in the matrix, stresses from mastication were transferred through the quartz particles into the resins resulting in microcracks and loss of particle. When softer filler particles are used, these stresses are partially absorbed by the particles, and further examination shows that the particles actually become worn and polished.[11]

Wear Rates of Composites

In comparing the research on the wear of one early composite (*Adaptic*) versus wear of the new generation composite, it was determined that the wear had not accelerated, but in fact decreased.[11] These researchers attributed the apparent reversal to the level of sensitivity associated with original evaluation methods. In the case of direct clinical evaluation (which was used in the early studies), only discrepancies greater than 150 μm were capable of being detected, whereas the indirect method has a resolution of 50 μm or better.

Several different possible explanations have been suggested for this particular wear characteristic. The first of these may be the fact that as the material begins to wear, the distance between the occlusal surface and the opposing cusp increases and thus, a decrease in stress concentration results.[11] Also, indications have been found that the use of rapidly rotating finishing instruments can cause detrimental effects during the surfacing of the composite. The energy that is released from such a use may result in microcracks which may radiate as much as 50 to 75 μm below the surface, thus weakening the restoration. Examination of the finished surface reveals small depressions and elevations. Under these conditions, the stress is unevenly distributed thereby contributing to a higher rate of wear.[11]

Many studies have been done and are continuing in the areas of wear of current posterior composite resins. Several products have obtained ADA provisional and full approval for use in the posterior region. Today, nearly all of the posterior composite

resins are substantially more resistant to wear than their predecessors. In fact, some of them have an average wear rate of less than 1 μm per month.[11]

In evaluating these new resins, researchers found that *Fulfil* (L.D. Caulk) had an average wear rate of 135 μm after 3 years and 158 μm after 5 years.[12] *Occlusin* (COE Laboratory) also has had extensive research done with similar results after 3 and 5 years.[13] These two posterior composite resins have obtained full ADA acceptance. In another study monitoring *Estilux Posterior* (Kulzer, Inc) over an 8-year period, researchers found a wear rate of less that 20 μm per year.[14] Also, an evaluation of *Herculite* (Kerr Co) showed 53 μm of wear at 2 years and on the basis of regression analysis, a projected wear of 97 μm at the end of 4 years.[15] Research on other resins, such as *Heliomolar* (Vivadent, USA, Inc) and *P-50* (3M® Co), have shown a wear rate of less than 12 μm during an average year, while another study demonstrated an average annual wear rate of 7 to 8 μm.[7]

Microleakage

One of the major problems with Class II posterior composite has been microleakage. This situation reflects the difficultly in obtaining good marginal adaptation, specifically along the gingival proximal margin. Studies have shown, in fact, that the cervical margin tends to have a greater amount of leakage than the occlusal margins, and microleakage at the gingival margin is even greater below the cemento-enamel junction.[16]

Reasons for Microleakage.

There are several reasons for microleakage: (1) difficulty in obtaining good marginal adaptation and placement of composite into the proximal box; (2) moisture contamination; (3) polymerization shrinkage; and (4) differences in coefficient of thermal expansion between tooth and composite.[8]

Adaptation and placement of posterior composites is one of the main factors related to the technique sensitive nature of resins. Similar procedures that are used to place amalgam restoration do not apply, and even procedures used to place anterior composite restorations are not the same.

Polymerization shrinkage is one of the inherent problems with posterior composites. Although the amounts vary among materials, polymerization shrinkage can range from 2.5% to 3.5%. The amount of shrinkage depends on the filler content with microfilled composites having greater contraction during curing. This shrinkage of the composite tends to pull the material away from the cavity wall. Investigation shows that shrinkage is toward the center of the mass with chemically activated resins and toward the light source with light activated resins. A problem associated with polymerization shrinkage is its effect on marginal adaptation. There is significant force generated on the wall of the cavity preparation during curing. Under such conditions, the resin may actually separate from the cavity preparation, resulting in gaps and voids which would be susceptible to microbial invasion and secondary caries.[7]

Finally, the coefficient of thermal expansion of some composite resins is higher than that of amalgam and is also considerably higher than enamel and dentin.[8] With the tooth and the composite resins expanding at different rates from temperature changes in the oral environment, microleakage can begin to occur from the separation at the composite-tooth interface.

Solutions to Microleakage.

There are several solutions that have been studied and can be used to try to reduce or eliminate microleakage: (1) Using glass ionomer as a base, (2) Incremental filling techniques, and (3) Beveling of the cavosurface margin.

A material that is growing in popularity today as a base under composite resins, as well as other restorations, is glass ionomer cement. These cements are composed of silicate powders and polyacrylic acids, and most of them are radiopaque.[2] Glass ionomers bond physiochemically to dentin and also display an improved marginal seal. Research has shown that at the end of 1 year, less microleakage occurs at the gingival margin of Class II restorations when a glass ionomer was used as a liner.[17]

Glass ionomer cements form a moderately strong physiochemical bond to dentin as well as enamel, and after etching with phosphoric acid, the posterior composite resin will bond to them. They display a low solubility in the oral fluid, and most release fluoride in concentrations that have been shown to have anticarious action.[10] Also, glass ionomers provide a rigid foundation for the composite restoration. This is considered important because the flexing of composite restorations under stress has been considered to be one of the mechanisms of postoperative sensitivity. An additional advantage to using glass ionomer is that

they have a coefficient of thermal expansion similar to enamel and dentin which could help prevent the breakdown of the marginal seal.[6]

In the filling of proximal boxes and deep restorations, research recommends incrementally filling of the cavity with approximately 1.5 mm to 2 mm of composite to ensure adequate polymerization.[6] One technique suggest banking the first two incremental placements, and then filling the center of the box.[18]

Beveling of the cavosurface margin of the preparation is somewhat controversial. In the case of occlusal surfaces, some researchers recommend the use of a bevel approximately 45E to the occlusal surface with a .25 to .50 mm width.[19,20] These studies concluded that the bevel did not eliminate, but significantly reduced marginal leakage. Other researchers, however, recommend an unbeveled occlusal cavosurface margin.[2,6] According to one researcher, a standard prep without a bevel will expose the necessary enamel rods, so beveling is not necessary. Some clinicians state that beveling increases the area susceptible to occlusal wear. Less controversy surrounds beveling of the vertical proximal cavosurface margins, with a general agreement that these margins should be beveled.

Treatment of the gingival cavosurface margin has been a subject of considerable interest, with several approaches being taken to reduce problems with possible gap formation and microleakage. A majority of clinicians advocate the use of beveling and state that placing a bevel here not only increases exposure to end cut enamel prisms but also widens the bondable enamel surface. Opponents state that the enamel prisms are already favorably oriented. In fact, one study found that gingival beveling did not reduce microleakage at the margin.[16] But this study reflected results only on margins located cervical to the cemento-enamel junction.

In previous light-curing techniques where light is directed from the occlusal surface, polymerization shrinkage occurs toward the light source, creating a contraction gap as the resin shrinks away from the gingival margin. With the advent of light activated posterior composite, the use of clear matrix bands and light reflecting wedges might be advantageous for more thorough polymerization. Several manufacturers offer clear plastic matrices that allow light polymerization directly on the proximal surface. However, these bands are not burnishable and their thickness and difficulty in proper placement may cause an inadequate proximal surface. In addition, it may be difficult to pass the matrix through a tight contact on one proximal surface.

Postoperative Sensitivity

Another major problem with posterior composite resins is the occurrence of postoperative pain or sensitivity. Incidences of up to 50% in posterior composite resin restoration have been widely reported.[8] Several reasons have been identified as possible causes of postoperative sensitivity: (1) Improper dentin coverage. (2) Toxicity of the composite resin. (3) Microleakage as a result of polymerization contraction or improper bonding techniques. (4) Cuspal deformation due to polymerization shrinkage resulting in distortions of the dentin, or occlusal discrepancies. (5) Hyperocclusion as a result of bonding agent or composite on the occlusal surface. (6) Deflection of the resin under occlusal stress, transmitting hydraulic pressure to the odontoblastic processes.[6]

Approaches to Minimize Postoperative Sensitivity.

Early investigations indicate that original composite resin materials were pulpal irritants. As a result, routine use of liners such as calcium hydroxide were used for pulpal protection. However, given the high oral solubility of these liners and the known microleakage problem, susceptibility to long-term oral dissolution was found, resulting in small voids open to bacterial invasion from polymerization shrinkage. Concerns about microleakage and subsequent bacterial invasion has generated considerable interest in dentin bonding agents. These bonding agents actually serves two purposes. The first is to enhance wetting of the prepolymerized composite resin to the prepared cavity. The second is to bond the restorative material to the preparation with enough adhesion to overcome the stresses generated by the curing shrinkage. Unfortunately, the bond strength of most 2d generation bonding agents does not exceed 600 to 750 psi.[7] Using this information, it can be reasoned that the bond strength is not sufficient to overcome the stresses caused by polymerization shrinkage and resultant postoperative sensitivity.

Prior to using any dentin bonding agents, determination must be made whether to remove the smear layer. Unless one is using a dentin bonding system that requires its removal, this should be avoided because of the smear layer's role in pulpal protection.

Proper occlusion is imperative to minimize postoperative sensitivity. During the finishing of the restoration, care must be taken to remove any occlusal

discrepancies. However, as stated previously, care must be observed in this technique so as not to incur excessive heat or mechanical battering that could potentially cause marginal failure.

Finally, polymerization shrinkage should be minimized. Utilizing the incremental placement techniques as described earlier will minimize not only microleakage and concurrent postoperative sensitivity, but cuspal flexion as well.

Case Selection

Many posterior composite restoration placed in the past have failed not only because of inadequate materials or improper techniques but also because teeth to be restored were selected indiscriminately. The general practioner, knowing the properties of posterior composite resins and understanding their limitations, can develop a comprehensive list of indications and contraindications for usage.[2]

Indications:

- When esthetics are of primary concern

- Small Classes I and II lesion(s) in the permanent dentition, with best results found in premolars

- Restorations with minimal or no occlusal contacts on the restoration

- Teeth in which occlusion is protected by anterior disclusion or multiple occlusal stops on adjacent teeth

- When there is known mercury sensitivity (an infrequent finding)

- To restore Class I and II lesions in deciduous teeth

Contraindications:

- Large area of occlusal contact on the restoration

- Existence of many carious teeth

- Large multisurface restoration

- When moisture control is not possible

- When proper preparation and matrix placement are inadequate or unable to obtain (deep boxes)

- When the operator has not the time nor the skill for proper placement

Since no clinical studies have proclaimed universal use in the posterior sextant, posterior composite resins should not be used as an unlimited substitute for amalgam. The general practitioner is ultimately responsible for informing the patient of both the benefits and drawbacks of posterior composite resins.

Conclusion

Posterior composite resins have demonstrated great improvements in recent years. In addition, many studies are ongoing with new materials continually being tested. The use of these materials requires the practitioner to continually be abreast of their properties, and as they improve, provide an alternative posterior restoration for their patients.

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Improving Combat Casualty Care: Focus on the Military Medic

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As military medicine in general copes with a rapidly changing world environment, so too must the backbone of the medical force, the enlisted medic. To meet these challenges, the training and utilization of military medics must match new and different missions. This article will explore innovative approaches to training and preparing for combat casualty care and field medicine. The focus will fall on the education, evaluation, operations, patient care skills, equipment and telemedicine potential of the military medic. Future directions for study and development will be suggested. Exploration of the following may improve the capability of the military medic: (1) improved training to include advanced-level skills and interventions for combat casualty care and broader exposure to the casualties expected in operations other than war (OOTW);(2) annual educational and periodic proficiency evaluation requirements;(3) strengthened medical control at all echelons; and (4) carefully selected additional equipment and technologies to enhance medical capabilities.

Introduction

The mission of military medicine is to preserve the fighting strength.[1] Traditionally, the focus has been on combat casualty care. However, the rapidly changing post-Cold War era has thrust new dimensions of care upon the military medical establishment.[2,3] Regional conflicts, humanitarian and disaster relief, peacekeeping and similar missions are frequently now the most prevalent types of missions.[4] Recent attention has focused on the preparedness of military medical personnel to support a wide variety of missions.[5] Criticisms include a lack of relevant training and preoccupation with beneficiary care to the detriment of combat medical skills.

The enlisted military medic is the backbone of the medical force. There are over 30,000 enlisted soldiers in the active Army medical career management field and nearly twice that figure in the reserve components.[6] Enlisted medics far outnumber the 9,000 Army physicians and nurses on active duty.[6] (Similar ratios but smaller numbers of medical personnel are represented in the Air Force and Navy.) Medics are represented as far forward as combat maneuver battalions (battalion aid stations and company medics) and throughout higher-echelon medical units. Therefore, any improvements in the medical force will necessarily hinge on the enlisted medic.

This article focuses on the enlisted military medic and the mission performed in Echelons I and II (battlefield care and initial resuscitation) units in both peace and wartime. The training, standards, evaluation, patient care skills, operations, equipment, and telemedicine capabilities of the medic will be examined. The emphasis is on identifying new and innovative approaches to improving military medical care in combat and field environment. The Army medical specialist (military occupational specialty 91B), the largest group of medics, will serve as the prototype. Air Force medical technicians and Navy hospital corpsmen share similar medical training and much of the discussion is applicable.[7,8]

Training and Evaluation

Army medics are trained at Fort Sam Houston, TX. The initial entry course is 10 weeks long, including approximately 150 hours devoted to basic-level emergency medical technology.[9] The academic and practical material parallels the civilian emergency medical technician (EMT)-basic curriculum. Unfortunately, most graduates do not achieve certification.[9] Clinical rotations in the hospital or on ambulance services are not performed, although a field exercise concludes the course.[10] Initial medical training of the military medic compares to the medic's civilian counterpart (Table 1).

Advanced-level EMT training is offered to higher ranking soldiers at the Army medical basic noncommissioned officer (NCO) course, also at Fort Sam Houston, TX. The didactic and practical material

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Topic	Army Initial	Civilian EMT-Basic	Civilian EMT-Intermediate	Civilian EMT-Paramedic
Duration, hours[74] (*beyond EMT-Basic)	150	110	100-200*	400-600*
Basic Life Support skills[75]	X	X	X	X
Advanced airway management[47]			X	X
Advanced trauma management			X	X
Basic Trauma Life Support skills[77]			X	X
Advanced Cardiac Life Support skills[76]				X
Pediatric Advanced Life Support skills[78]				X
Pharmacology[47]				X
Clinical rotations[74]				
Field/ambulance service		X	X	X
Emergency department		X	X	X
Anesthesia			X	X
Intensive care unit				X
Obstetrics				X

Table 1. Duration and Content of Typical Army and Civilian Pre-Hospital Training Programs

includes some portions of the EMT-paramedic curriculum, but like the entry-level medics, certification is not achieved.[11] Clinical rotations are also not conducted.

The military requires the licensure and certification of all military professionals (physicians, nurses, and pharmacists) and enlisted vocational nurses.[12] However, military medics are not covered by this requirement. (A very small number of medics engaged in organized installation-level pre-hospital services are required to hold EMT-basic certification.)[13,14] There is also no standardized evaluation of Army medic skills.[15] Continuing training and verification of proficiency is the responsibility of individual units. Unfortunately, it is widely recognized that achieving quality, continuing education and verification of proficiency is difficult in combat units. The lack of success in maintaining the medical proficiency of medics is felt to be hampered by schedules heavy in field exercises and maintenance.[16] In contrast, civilian

standards of proficiency are set by state law or regulation and are far more stringent than military standards (Table 2).

Requirement	Army	Civilian
Certification	not required	required
Recertification	not required	every 2 to 3 years
Continuing education	not required	8 to 20 hours annually
BLS[79] and ACLS[76] course completion	not required	required
Medical (physician) control	not required	required

Table 2. Typical Practice Requirements for Army Medics and Civilian Pre-Hospital Personnel

Patient Care Skills

Combat casualty care frequently focuses on the management of penetrating trauma. Rapid assessment and airway control followed by immediate evacuation to a hospital capable of handling the traumatized patient are the hallmarks of optimal trauma management.[17] Invasive lifesaving procedures are aggressively performed, but never at the expense of rapid evacuation.[18] Endotracheal intubation may be the procedure with the greatest lifesaving potential.[17] Intubation also allows for hyperventilation, one of the few significant field interventions available in cases of head injury.[17,19] Other procedures such as cricothyrostomy, thoracostomy, and pericardiocentesis have value in selected cases of trauma.[20-22] Between 0.4% and 0.6% of battle casualties can be expected to present with acute upper airway obstruction necessitating an immediate surgical airway.[23] Intravenous fluids have limited value in the management of penetrating trauma, particularly if evacuation times are short.[18-24] The long evacuation times expected in combat environments may increase the value of intravenous fluids.[25] Training military medics to perform these and other selected procedures may improve their medical capability in combat casualty care.

Drug therapy plays a small but important role in the management of combat casualties. Selected types of trauma patients may benefit from drug therapy, particularly if delivered intravenously or by inhalation. Being the first healthcare provider to confront a casualty, the medic is in a position to provide time-sensitive therapy. This may be particularly important in improving outcomes in spinal cord injury, head trauma, and in preventing wound infection.[26-28]

Triage decisions in a mass casualty incident depend on accurate and rapid patient assessment.[29] The most experienced and trained individual should serve as triage officer.[30] A paramedic is the preferred level of skill for initial field triage when a physician is unavailable.[31] Knowledge and clinical skill beyond current medic levels may improve identification of patients needing urgent field intervention (relief of tension pneumothorax). Confident and skilled medics can also reduce overtriage by making accurate assessments of casualties.

Despite the penetrating trauma focus of combat casualty care, statistics show disease and nonbattle injury (DNBI) consistently accounts for 5% of combat mortality and significantly greater morbidity.[32] A review of recent conflicts suggests between 26% and 36% of combat troops will have DNBI presentations sufficient to preclude return to their units.[32] During the Gulf War, DNBI casualties far outnumbered direct combat casualties. Two U.S. Navy hospitals experienced a combined DNBI load of 1,820 casualties for a 6 month period (DNBI rates were not available).[33] Burkle et al, reported a 6% nontrauma rate for allied forces and an 11% rate for enemy forces treated by allied facilities.[34] Large outbreaks of diarrheal and respiratory illnesses and lesser outbreaks of dermatological and psychiatric problems were also reported.[35,36] Since medics must recognize and frequently assist in the treatment of DNBI, greater emphasis in infections disease, asthma, and orthopedic management is needed.

Operational Challenges

The military has a long and proud history of providing humanitarian relief.[37] As early as 1792, the

Congress sanctioned Army involvement in humanitarian relief efforts. In 1902, over 10% of the active Army strength participated in the relief of the Great San Francisco Earthquake.[38] Twenty-three thousand U.S. forces deployed for disaster relief during the aftermath of hurricane Andrew.[38] Gunn argues for an expanded role for the military in humanitarian missions.[39]

However, OOTW, particularly humanitarian missions, have the potential for exposing the military medic to a much broader range of patient types than conventional combat. Children, women, elderly, and handicapped patients can be expected.[40,41] VanRooyen et al reporting on the Somalia military relief effort, showed 52% of patients were women and 49% were under the age of 13 years.[42] Pretto et al reported in 1995 that nearly 15,000 wounded children were treated in Bosnia-Herzegovina.[43] Vujovic et al reported an age range of 3 to 88 years for casualties requiring hospitalization in a 6-month period in 1992 in Sarajevo.[44] In Operation Provide Comfort, U.S. and allied forces provided relief to as many as 760,000 Kurdish refugees.[45] Bennett and colleagues reported on 2,971 patients under the age of 12 years.[45] The Israeli experience in disaster relief further underscores the importance of medic competency in recognizing and treating nontraumatic disease, preventive medicine, and environmental health.[46]

Equipment and Telemedicine

New equipment and technology can dramatically enhance the capability of the medic. Critically ill and injured patients require constant physiologic monitoring from the moment they enter the medical system. Electrocardiographic monitoring is standard for patients being transported from site of injury or illness to the hospital.[47] Electronic sphygmomanometry and pulse oximetry are increasingly common, as are other technologies.[47-49] Most of this equipment is relatively robust and routinely survives the harsh environments encountered in pre-hospital care. The personnel status monitor and life support pod proposed for the modern battlefield will likely incorporate some or all of these technologies.[50] However, medics must be trained to interpret and act on new technologies to fully realize the capabilities of the new systems. Other proven medical technologies may improve military medic capability on the battlefield.

Advanced-generation telemedicine has gained momentum as a potential leap in military medical capability.[50,51] Original telemedicine development was not targeted for Echelons I and II medical care.[52] However, recent experiments have been focused at this level.[53] Challenges to successful fielding of combat telemedicine include reliable communications, weight and size restrictions, and cost. Training of medical personnel to exploit the enhanced capability is critical. This training must transcend mere use of the technology and include in-depth medical education and experience. Training notwithstanding, Cloonan vehemently argues against forward application of telemedicine because of usability concerns. Instead, he suggests electronic medical references and tele-education applications are more likely to succeed.[54]

Discussion

A standard war surgery text states "Skilled medical attendants are needed (during evacuation) to maintain the airway, support respiration, control hemorrhage, and ensure the adequacy of blood or fluid volume replacement ... " and that " ... Rapid helicopter evacuation alone is not a substitute for adherence to the[se] ... principles."[55] Unfortunately, the typical Army medic is incompletely trained and inadequately experienced in these tasks.

In response to a perceived need for increased medic training, various units have explored supplemental training. Cancio and Goforth describe a basic EMT and Basic Trauma Life Support course for medics of the 82d Airborne Division.[16] Other programs have been described, but information on the extent and success of these programs is lacking.[56-59]

As part of the "Division 86" initiative in the early 1980s, the Army proposed a program to train all medics at the EMT-basic level and all medical NCOs at the EMT-paramedic level.[11,60] This program was never implemented.[7] Since then, authors have continued to call for better trauma training of medics.[61,62] Bellamy recommends better training of medics in the recognition of life-threatening wounds.[63] Bartz notes the gap is widening between training and job requirements and suggests periodic training to narrow the gap.[64]

Training beyond trauma skills is emphasized by several authors. Blake, commenting on the Persian Gulf War experience, states that the "Total focus on acute surgical trauma is not appropriate."[65] He further notes a lack of nuclear, biological, and chemical (NBC) training among medical personnel. Jagoda and colleagues argue for training in intubation, intravenous medications, and defibrillation.[7] They also underscore the importance of clinical experience in assuring proficiency. A national emergency care organization calls for a minimum acceptable standard of certified EMT-basic for all military medics.[66] Leonard felt Air Force crash-rescue medic training fell below prevailing standards and proposed a training level of

EMT-paramedic.[67] Ironically, the military medical experience in Vietnam sparked civilian interest in advancing emergency care of patients outside the hospital.[68] Since then, civilian emergency medical services (EMS) has developed into a highly successful and integrated system that has surpassed military medical capabilities in many respects.[7]

Providing relevant and realistic training for military medics can be challenging. Obstacles include a lack of patients, trainers, and equipment. The military has relatively few ongoing opportunities to train in trauma care, NBC-exposed patients, and the patients expected in OOTW. However, civilian hospitals and EMS systems are frequently involved in operations with similarities to military missions. These civilian operations provide fertile ground for innovative training opportunities for military medics. Examples include trauma center care and medical support for law enforcement tactical units (tactical EMS) on hostage crisis situations, counter-narcotics operations, and antiterrorism activities.[69] Hazardous materials incidents share many aspects with casualty management of NBC weapons, including the wearing of protective ensembles, patient decontamination, and medical treatment.[70]

Arguments against advanced skills for medics generally focus on the fast, furious, and austere conditions of all-out war. Critics feel this environment does not lend itself to the high technology care civilians enjoy. This perspective may have had validity when the mission focus was a massive European war (with thousands of casualties generated in just the first few days of battle). However, the modern military mission is unlikely to include this scenario. Instead, limited engagements such as Grenada, Desert Storm, Haiti, and Bosnia dominate the horizon. In these engagements, the public (and our soldiers) expects a high degree of medical sophistication and will not likely tolerate care substantially inferior to that available in the U.S. Furthermore, training medics for advanced-level care does not preclude them from reverting back to austere care when the situation dictates. Civilian paramedics have readily learned to differentiate between injured patients needing "scoop-and-run" rapid transportation to the trauma center and others who might benefit from multiple field interventions. The same flexibility can be expected of properly trained and experienced military medics. Recent Army reviews have recommended resuscitative capability for immediate treatment of combat casualties and en route medical care during evacuation as top priorities for battlefield medicine.[50] This assessment supports the need for advanced medic training because these two early phases of care are dominated by military medics.

Others argue against training in pediatrics, geriatrics, and similar skills because medics will not be treating indigenous populations during humanitarian missions. These critics believe only the licensed professionals (physicians and nurses) will treat the elderly, children, and pregnant women. However, lessons learned from the humanitarian missions in Guantanamo Bay, Cuba, and Panama refute that claim. Medics treated or assisted with thousands of patients and after-action reviews recommend training military medics to civilian EMT standards and requiring clinical experience matched to the patient population.[71]

Despite repeated calls in the literature and within the Army to require EMT certification for all medics, to date, this requirement has not been implemented.[66,67,71] The EMT certification remains the national standard for training and proficiency for entry-level emergency care providers in the field, regardless of place of employment.

Proponents note that EMT certification is a much-needed marker for clinical proficiency in basic first aid and emergency care skills. The EMT certification is a convenient, off-the-shelf tool for the commander to gauge an individual medic's proficiency in such basic skills as casualty assessment, vital signs measurement, airway management, bleeding control, and treatment of shock. The EMT certification can serve as a foundation for a total training package that also includes additional material on combat casualty care, military-specific medical tasks, and soldiering skills.

Introducing EMT certification to medics Army-wide has benefits in addition to establishing a universally-accepted, basic, entry-level skill set for all medics. There exists a broad network of community pre-hospital continuing education programs which remain virtually untapped. Accessing this training could be particularly beneficial for reserve component medics, where sustainment training is most challenging. Certification would also broaden training opportunities at hospitals and ambulance services nationwide. Typically, these institutions require some sort of certification to participate in patient care activities. Lastly, EMT certification would give soldier-medics a valuable credential to use in gainful employment when they leave the Army. This last benefit is not to be underestimated, as it may serve to attract more and better-quality recruits.

Achieving improved medic training is not without costs and limitations. The EMT-basic certification is readily achievable within the framework of a 10-week course, given the proper resources. More intensive paramedic-level courses are roughly 4 to 5 times as lengthy as current initial emergency care training for medics and would be more expensive to achieve. Other potential obstacles include assuring medical control and arranging required clinical rotations. Organized and accredited continuing education programs will also be needed. Army medics selected for the basic NCO course receive instruction that includes portions of the paramedic curriculum. However, current Army personnel management encourages these better-trained medics to occupy leadership positions instead of direct patient-care jobs.[72] A clinical ladder for NCOs must be developed to retain clinically-proficient senior medics in positions requiring bedside care.

New tools and technologies must be carefully selected and tested to avoid burdening the medic with heavy and bulky equipment of limited value. Small, relatively light implements such as endotracheal intubation sets, thoracostomy and cricothyrotomy needles, and limited intravenous medications may be appropriate. Alternatively, the bulkier pulse oximeter may actually conserve many times its own weight and volume in bottled oxygen by accurately gauging blood oxygenation.[73] As all cases of high technology, increased training is required to fully exploit the potential benefits.

Conclusion

Challenges face military medicine as it adapts to a new world order. Exploration of the following may improve the capability of the military medic: (1) improved training to include advanced-level skills and interventions for combat casualty care and broader exposure to the types of casualties expected in OOTW; (2) annual educational and periodic proficiency evaluation requirements; (3) strengthened medical control and physician involvement at all echelons; and (4) carefully selected additional equipment and technologies to enhance medical capabilities.

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The PROFIS Physician in the Light Infantry Division

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There is little to prepare the Army physician to treat deployed soldiers with a light infantry battalion, brigade, or division. In many cases the equipment belongs to past generations and the field conditions may be austere. The risk of infections in the context of field hygiene is largely unexplored. The process of patient care is typified by hours of boredom punctuated by moments of bedlam, which at best may be harrowing and at worst deadly. What physician or physician assistant (PA) is trained to start intravenous (IV) lines by red-lens flashlight or put chest tubes in a patient on the floor of a dusty tent? Few clinicians in any specialty are adequately trained for the intensity of trauma care which typifies combat. Indeed, combat is probably the only "training ground" where this expertise can be gained. Similarly, the diversity and breadth of peacekeeping missions ("operations other than war") extend beyond the knowledge base of any single specialist.

Despite the complexity of equipping Army clinicians who are accustomed to Class B uniforms and the well-lit treatment areas, certain specific steps can be taken to prepare practitioners to meet the diverse medical needs of the light infantry mission.

Personal Preparedness

Assignment to Professional Officer Filler System (PROFIS) slots should occur no sooner than 6 months after arrival at a new military treatment facility. Often, Army physicians first become aware of the existence of PROFIS upon arrival at their new assignments from their graduate medical education training programs. They are quickly matched to PROFIS positions to relieve their older colleagues who have held the slots, and who may be anxious to "step down." So while first struggling with the realities of being new staff physicians, they also find themselves designated as "field surgeons." As in all things, the least urgent gets the last attention, so the field position is often ignored. A policy which delays the assignment until the graduate physician has time to adjust to a new assignment and medical facility might help to alleviate this conflict of attention.

The issue of TA-50 (personal equipment issue) is the first indication that the clinician is in the "real Army." The equipment is often picked up at a central issue facility and then stored undisturbed until the frantic days or hours prior to deployment. An experienced noncommissioned officer (NCO) or more experienced, senior clinician should mentor the newly-assigned physician through equipment issue and the process of assembling the personal equipment (Kevlar, rucksack, load-bearing equipment). In addition, a seasoned NCO, PA, or physician can provide the newly-assigned clinician with a list of personal items to purchase and have ready (subdued undergarments, camouflage face paint, wash basin, plastic pail, toiletries with field mirror, and additional items of cold weather [so-called "snivel"] gear). A set of references for field use is also an important, early acquisition: *Emergency War Surgery,* the *Advanced Trauma Life Support (ATLS) Manual, Sanford's Guide to Antimicrobial Therapy,* and *The Merck Manual* have all proved useful. In a light infantry division, preparation for personal comfort in an environment without sleep tents or individual vehicles is critical. Soldiers sleep on the ground, and small "tactical" tents, ground covers, and self-inflating sleep pads can all be obtained through outdoor/adventure stores and catalogs.

The medical facility where the clinician is assigned bears the responsibility of completing the clinician's personal readiness profile after the PROFIS assignment (ID tags, MARC card, wills, power of attorney). The imperative is that the clinician be completely prepared to deploy within a few hours of notification. The remaining hours prior to departure can then be spent with family and friends.

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Professional Preparedness

No matter what specialty clinicians practice in peacetime, they must be prepared for trauma care in combat or its close replication in intense training environments such as the Joint Readiness Training Center (JRTC) at Fort Polk, or the National Training Center (NTC) at Fort Irwin. To this end, each PROFIS physician must be qualified in ATLS and requalified as needed. This is the primary expectation of the practitioner in a light division. Readily quantifiable skills such as weapon and nuclear, biological, and chemical training can be acquired quickly in the deployment staging process. Training in field sanitation and preventative medicine techniques, which are often only hastily reviewed in the basic and advanced courses, can be emphasized in the garrison training of a PROFIS physician. In addition, garrison preparation for physicians and medics should stress proper wound dressing, splinting, and trauma management. These are areas where physicians are likely to be deficient and they are unlikely to have anyone available to provide thorough review in the deployment staging area.

For clinicians who lack prior military service, their only exposure to the military may be officer basic and the combat casualty care course. Thus, they are introduced to a unit where even the most "green" enlisted soldiers have more military and field experience. Opportunities for military training which include field experience (airborne school, air assault school, Expert Field Medical Badge training) should be seized, even during graduate medical education. Badges awarded by these schools provide a level of credibility which eases a clinician's transition and acceptance into the field setting, and thus they provide an additional benefit. At some centers, a field training exercise for house staff has been initiated. The PROFIS physicians may familiarize with the medical company and its personnel with minimal sacrifice of their time. In this concept, the medical company deploys to the hospital grounds, and the clinicians can work with unit personnel for several hours of focused instruction.

Despite the impact it may have on the new physician's clinic schedule, every opportunity should be provided for a PROFIS assigned physician to gain experience with the assigned unit. The key to the success of a medical operation in a light infantry deployment is training with the assigned unit. The absence of this relationship between clinician and field unit is noted frequently by evaluators of medical companies at the JRTC. Physicians who are PROFIS assigned to medical companies or battalion aid stations (BAS) often have no experience with the unit prior to deployment. There is no substitute for training alongside the officers and enlisted personnel of these units in site selection, facility set up and tear down, as well as treating real and notional casualties in this environment. For example, the uninitiated physician is not familiar with the unit's authorized equipment and medical chests. Only with experience can the clinician hope to be able to anticipate potential medicinal or equipment deficiencies when complex light infantry missions arise, such as the Wake Island refugee missions.[1,2]

One thorny issue which medical corps captains or majors will encounter is the fact that they will often be the senior officer in the battalion infantry medical platoon or support battalion medical company. This can result in anything from an uncomfortable truce to overt hostility if the limits of authority are not established from the start. Historically, the brigade surgeon has become the medical company commander in time of war and the medical service corps captain, the executive officer. In recent experience, this has led to an uneasy situation where the most experienced leaders were forced from the position they were best equipped to take. In practical terms, the physicians in the medical company and the brigade surgeon are wise to recognize established lines of leadership. In most cases, each physician's authority extends only to those things which specifically affect the care of his or her patients. Assembly of tents, vehicle camouflage, fighting positions, site selection, and layout are not within the physician's expertise or jurisdiction, although an opinion may be sought. For clinicians who are often "take-charge" individuals by nature, personal restraint will be a recurring challenge, but well worth the effort. The operational medical staff (the Brigade and Division surgeons) should alert the incoming PROFIS physicians to these potential conflicts prior to their development. Every effort should be made by the physician to seek out the advice and expertise of senior NCOs.

Deployment and Treatment

Clinicians will find themselves deployed at one of several levels in the light infantry division. In the infantry medical platoon, they will function as medical officer with a PA. In the forward support battalion medical company, they function similarly with one or two PA's, and one to three other physicians, each assigned to a "treatment team." The brigade surgeon, a physician in a staff position, will also be located in the brigade support area and may be available to assist the medical company. This company has the same equipment as the BAS with the addition of a 20-bed holding capacity for up to 72 hours. Two licensed

practical nurses, MOS91C, staff this facility. When fully operational, the medical company also has dental, x-ray, and basic laboratory, as well as blood storage capability.

Practitioners will be assigned to one of three areas in the medical company, depending on the unit's mission and basic organization. The triage area is often supervised by the dentist, who becomes responsible for the initial evaluation and care of patients, until they are able to be brought into the area support tent for ATLS care. One to three treatment teams will be operating in the tent with a physician, an NCO, and a medic. When there are additional professionals, a physician and PA may work with each patient. The evacuation officer monitors the patients who have been treated while they await evacuation. Casualties who deteriorate and require additional care are identified by this officer and their return to the treatment area is coordinated with the triage officer. In the light infantry medical company, the triage and evacuation officers may be working in the dark on the ground by red-lens flashlight, conditions which only add to the difficulty of the task.

While simulated casualty play at JRTC or the NTC has the highest visibility, disease and nonbattle injuries are equally important and historically have resulted in a higher number of casualties in combat and in operations other than war. Light infantry soldiers in the field suffer from musculoskeletal injuries, skin infections, severe rashes, respiratory infections, and gastrointestinal infections with vomiting, diarrhea, and dehydration. The evacuation officer will also be responsible for these patients who are admitted to the holding tent. Minor and major medical problems (anaphylaxis, spider and snake bites, cold and heat injuries) constitute a significant portion of the PROFIS physician's time while deployed. In combat, sick call will likely be 24 hours a day, to insure optimal care of all soldiers. The physician's responsibilities will be rotated to insure an adequate work rest cycle. In some deployments, the PROFIS physician may find himself the senior medical authority in a country where physicians are few and far between.

One recurring problem which plagues the medical company has been termed "the changing class picture," where professional and support staff are continually rotated in and out of the brigade support area facility. This occurs when the treatment teams are sent forward, (so-called "jump" teams) and staff members become ill, wounded, or killed in action. Even poorly synchronized work/rest cycles may place professionals with support staff with whom they have no experience. It is critical that pre-combat inspections and battle drills for the medical company include "dry runs" for the treatment team, often with each shift change, to insure that the coordination will be smooth when patients arrive. In addition to these "battle-drills," prepackaging of medical equipment around specific procedures provides a means for rapid treatment. The IV sets include starter kits, tape, dressings, needle, IV fluid, and tubing. Chest tube kits include gloves, chest tubes, drapes, drainage valves, scalpel, curved scissors, and hemostats. These kits can be assembled by personnel in the treatment area during "off" periods.

It has become the vogue at the training centers to position medical officers and treatment teams well forward. This is an effort to place ATLS care as close to the point of injury as possible. This is where the highest "died of wounds" rate occurs in these training environments. Unfortunately, this leaves valuable medical assets, trained medics, and practitioners as well as Class VIII supplies dangerously vulnerable to enemy action. These forward-placed teams have unacceptably high "death" rates in these training scenarios. A similarly high rate is readily imaginable in combat.

Casualties die of wounds at the training centers and in combat when they are not provided with adequate initial care (wound dressing, judicious tourniquet use, IV therapy) or adequate follow-on care (missed shock or respiratory compromise). However, the single greatest reason for a notional or real casualty to die of wounds is the delay in reaching definitive care. Trauma victims generally require an operating room and a surgeon. Neither asset is organic to basic light infantry medical support. Thus, every effort should be made to get casualties to lifesaving surgery. This is accomplished by positioning surgical teams with the medical company or expeditiously evacuating patients to a hospital above the brigade level which has surgical capability. This is particularly important for soldiers with severe head wounds or penetrating chest or abdomen wounds. In a recent JRTC exercise, 70% of the patients who "died of wounds" at the medical company had suffered severe (notional) head or abdominal injuries.

For this reason, patients with severe trauma who have been stabilized by battalion treatment teams should bypass the brigade support area and the medical company whenever possible, to avoid a delay in surgery. If ground evacuation is necessary, the medical company may serve as an ambulance exchange point where the patients are downloaded from medical company ambulances, screened by medical company

personnel, and transferred to vehicles from corps level for evacuation.

Personal Survival

The physician in a light infantry medical company or BAS is armed with a 9-mm pistol. Engagement of the enemy with a pistol "doesn't count" in a training environment and only provides individual protection in combat. While the practitioner should be an expert in the care and use of the firearm, its minimal firepower underscores his or her role in a firefight: survival. A typical encounter with the "enemy" at the JRTC leaves most of the medical officers "dead" or "wounded." They are often specifically targeted by the terrorist forces. Once treatment areas are assembled and operational, each clinician should prepare a well concealed "survival" position (as opposed to fighting position) with overhead cover for protection from indirect fire. This may be a bitter pill to swallow for Americans raised on Stallone and Schwarzenegger. However, a dead physician cannot treat patients, and thus, cannot accomplish his or her primary mission. In a hostile environment, ready use of cover and concealment as well as noise and light discipline will go a long way toward survival. These skills should be acquired from experienced colleagues or NCOs in garrison or on field training exercises.

Conclusion

The Army medical officer is a soldier who practices medicine and not a doctor in a uniform. Soldier skills and field experience are essential elements of training for military physicians, and will aid in a smooth transition to a PROFIS assignment. Survival and success in assignments with the light infantry division are both possible and attainable with adequate preparation and rehearsal. The role we fill is both an honor and an opportunity to serve in the highest tradition of the medical profession.

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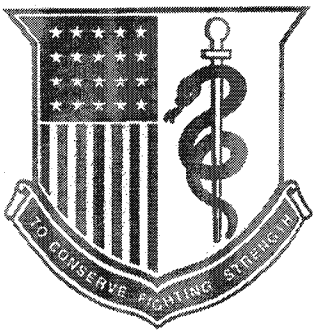

Soldier-Teams: A Personal Viewpoint

LTC James O. Pittman†

On a a hot day in the Sinai when the wet bulb is reading over 141 and the heat is so overwhelming that sweat evaporates from your body as soon as it escapes your skin, it is very easy to lose track of the complex reasons which brought you to a place which is the epitome of desolation and isolation. Almost everyone who is sent there for peacekeeping duty has to find some way to adapt to the environmental, physical, sociological-political, and military rigors of existence, and every iteration deployed since 1980 has been challenged with developing strategies to maintain preservation of their force.

I remember one afternoon being required, with most of the Task Force Special Staff, to stand outside the Task Force Headquarters building for over an hour in this environmental oven because some minor functionary from the Egyptian town of Sharm El Sheik decided to pay the Multinational Peacekeeping Force and Observers (MFO) a visit. He was unhappy because the U.S. battalion commander had lodged a complaint against the municipal government of which he was in charge with the Norwegian Major General who commanded the MFO.

It was explained to me that the main water supply for the 600+ Americans stationed at South Camp was provided from a salination point just outside Sharm El Sheik. In order to get water, it had to be pumped by an electric pumping system which was in a manhole-type depression and operated by pressing a green button and switching a flow valve. For some reason the Egyptians delighted in turning off the water unexpectedly during the hottest part of the year. They would usually start-up the pumps after the Task Force Commander invited them to free lunch and drinks at our Officers Club.

It is hard to imagine what it feels like to be baked in the sun all day, sand like talcum powder in every pore and orifice of your body, and learning that you can't shower until some minor bureaucrat decides to turn on the water. It makes you ponder the meaning of the term "Partner's in Peace" What's really interesting, however, is the degree of rage that an 18 year old paratrooper can muster after being told he can't shower at the end of his duty day because the Egyptians have turned off the water. You may be wondering, "What's the big deal, nobody promised soldiers a rose garden." Although you may be correct in this observation, you are missing the obvious dilemma that any change in routine creates in the fragile balance of adaptation versus temporal dysfunction.

What you have in this situation is a soldier who is a rapid deployment "Shock Trooper," trained to engage enemy forces in combat and destroy them as quickly as possible. He has not been prepared for a constabulary-type role which is characterized by long hours of watching, observing, and mostly devoid of any high-intensive military activity. In a short time, boredom, not enemy soldiers, are the principal threat to his life, and he develops, if he is lucky, a routine marked by individually tailored coping skills to enhance soldier-team survival. This "routine" can be critical to his day-to-day functioning, and any modification can result in everything from complete alienation from his soldier-team to fatal accidents. This evolution of adaptation to temporally-induced stress has been well-documented in the Sinai and other peacekeeping scenarios.[1]

What does all this mean? For one thing, it provides an example of how dependent American military troops have become on the illusion of controlling their environment and conditions. Things have to be predictable, within acceptable tolerances of success, approaching parameters of acceptance, creating windows of opportunity, meeting quality assurance, total quality management, continuous quality improvement, skill qualification test, "LMNOP standards"; being the "ultimate weapon delivery system." Anything as unexpected as an Egyptian turning off the water creates a state of disequilibrium in the soldier and the team, and nothing is as unpredictable as an American soldier in a state of disequilibrium — sometimes called abject confusion. In this rather curious mental state, anything can happen and military history provides us some glowing examples.

At the Battle of Gettysburg, COL Joshua Chamberlain, his command decimated by casualties, low on ammunition, and facing another Confederate attack on Little Round Top, ordered a bayonet charge downhill into the ranks of some of the best soldiers of

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the Confederacy led by General John Hood.[2] Although Chamberlain's actions were quite heroic, there were really very few options for him to employ. He could have stayed on the top of the hill until he was overrun or attacked in a totally unpredictable fashion. It was this aspect of "unpredictability" which won him the day. Why? In a tactical sense, it may be because Chamberlain's command, the 20th Maine, *ceased* acting in a predictable manner. There have been other less heroic examples in history where the predictability of U.S. Forces got them butchered (Kasserine Pass/ Task Force Smith). Predictability of the soldier-team can win or lose battles. It all depends on who is doing the best predicting, and who can manage the violence on the battlefield where it counts.

Military history has shown time and time again that the best laid tactics and strategy can be irrelevant if leadership on the ground is poor and soldiers lack the motivation and discipline to effectively export violence to the enemy. An old saying neatly puts this into perspective, "It is better for a herd of deer to be led into battle by a lion than a herd of lions to be led into battle by a deer." Joshua Chamberlain, who went on to win the Congressional Medal of Honor and achieve the rank of General, was certainly a lion who proved the validity of this statement.

In the good old days, we were, for practical purposes, "generalist soldiers," expected to "do or die" in any situation. Winning was everything and as George C. Scott said in the movie version of *Patton,* "Americans cannot tolerate a loser." The nature of "winning," however, seemed to be entirely related to a combined "team" effort, with victory dependent on the fluid movement of many different components. If all the components worked correctly-we won, if not, and we survived, we withdrew for an overhaul to try and get it right the next time. The military, in a larger sense, was similar to a mechanism which had to be designed and engineered correctly in order to function. The "soldier" was in reality a component of this mechanism and never really expected, or allowed in most cases, to function or act independently of the rest of the components. We took orders and performed our specific jobs in support of the larger mission. The "ultimate weapon" was *NOT* the individual soldier, but rather the machine is components-which we will call the "soldier-teams" The quality of leadership, discipline, and obedience within that team, along with individual soldier skills and individual professionalism, determined the degree of success or failure on the battlefield.

These observations might offend those who still buy into the romantic notion that winning is primarily an individual effort instead of a conditioned response of a group of human beings given permission to behave or think in a predetermined manner, usually under complex guide lines like rules of engagement or combined arms doctrine, which sometimes provided victory in battle. There was, in reality, little independent action or decision-making in the larger picture of battle operations by the very soldiers who fought the battle. If there has been, history would be marked with statements such as, " Colonel, you're in a chopper a mile up in the air and I'm up to my backside in enemy soldiers — its my decision to pull out and give this hill back to the enemy because I don't want me or my men to die." This is not to say that individual leadership and experience are not critical components to victory. To the contrary, it is the ability of leaders to motivate team-action and reaction which usually induces men to follow orders into battle. Few individuals have won battles by themselves; they are usually won by superior leadership and the overall soldier-team effort.

In review of the literature of human behavior on the battlefield (and there are hundreds of documented works) recurrent themes concerning what decides victory consistently appear. Many of history's greatest military thinkers including Thucydides, Sun Tzu, and Von Clauswitz, stated that amongst the many attributes of a military force, loyalty, obedience, and above all-discipline, were key to overcoming the impulse of independent action in favor of unit teamwork.[3] In other words, people sometimes do things totally outside the framework of rational human behavior — like charging machine guns or throwing themselves on grenades for their "team." It is *NOT* normal behavior to expose oneself to death, mutilation, or serious injury, nor is heroism hereditary in nature. After three combat tours in Vietnam and seeing enough action to last me a lifetime, it is my opinion that heroic actions are usually the product of abject loyalty to the soldier-team, bonded unit cohesion, impulsive action, or in many cases, naiveté as to the consequences of exposing oneself to enemy fire. Some soldiers truly *DO* think they are bulletproof. In most cases, however, the thought of letting down our buddies and the team was so reprehensible that risking death or injury was sometimes preferred over giving into our own need to survive. Soldiers in battle can become so dependent on this soldier-team bond that they frequently expose themselves to situations which could cost them their life in support of their soldier-team.

We have learned to become so dependent on the philosophy of the "soldier-team" that it is difficult to envision alternative modes of military functioning. Regardless of how successful unconventional means

stressing individual, autonomous action may be, our Armed Forces are still guided by the warfighting philosophy of the soldier-team effort. Future technology may force us into examining the individual soldier as an autonomous weapons system instead of the soldier-team. This is true when one considers the high-tech nature of laser weapons, target acquisition, and individual high-tech weapons systems that, if not already developed, are just on the horizon. What happens when a single soldier is capable of having the warfighting capabilities of a modern Infantry platoon? When a single soldier can direct lethal fire in a 40-mile zone, will the team-unit concept be obsolete? Interesting food for thought, and I'm sure the technocrats, most of whom have probably never been in a fist-fight, let alone in combat, are having a field day with this idea.

I suspect that hardened soldiers in places like North Korea and China probably could care less about our techno-toys or "victories" in the last 15 years, and there are those who speculate that an overemphasis on technology has never been a decisive factor in the winning of major wars. After all, we had nuclear weapons during the Korean and Vietnam Wars and were the most powerful military force on the planet during our ventures in the Gulf, Lebanon, and Somalia. We still managed to score one draw, one defeat, one win, and two "strategic redeployments."

Many Americans are still trying to figure out what has been accomplished in the Gulf War and in recent peacekeeping missions. We won a "100-day war" in the Persian Gulf, but the "bad guys" are still around; we deployed to Somalia for "humanitarian reasons" and, eventually, to control the "bad guys" — but they too are still around. We consistently deploy the most modern technology in existence and oftentimes accomplish questionable results. When the final chapter on the American military experience in Bosnia is written, I surmise that any perceived "victories" will be secondary to the individual abilities and sacrifice of the American soldier and the soldier-team, not the technology at their disposal.

The future may hold a radical shift in warfighting doctrine concerning the management of violence on the battlefield and emphasizing the individual soldier as an autonomous "weapons system." Until that time, the soldier-team concept will continue to guide our philosophical doctrine in everything from warfighting to family preservation efforts. It is critical to the preservation of our fighting forces and vital to the efficacy of our Armed Services that we develop soldiers who can function effectively in soldier-teams. Discipline, loyalty, esprit de corp, obedience, and professionalism must never be sacrificed in the name of political correctness or by those who lack the moral courage to do and stand up for what is right. American soldiers will continue to serve in America's wars and shape the face of battle as they have for over 200 years. As individual soldiers, they must be prepared to fight the wars and as soldier-teams, win them.

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Bugs, Drugs, and Root Canals

LTC Frederick R. Liewehr†

One of the most frequently prescribed yet least well understood medications in the dental armamentarium is the antibiotic. A patient with a toothache seen after hours is more often than not given a prescription for an antibiotic and an analgesic and told to return to the clinic on sick call the following day. The presumption is that the combination of these drugs will allay the patient's symptoms and treat his presumed infection so that his condition will be stable until sometime when it is more convenient to treat him definitively.

While potentially a useful, even lifesaving drug, the antibiotic is certainly not innocuous. Side effects of these drugs range from stomach upset to ulcerative colitis to anaphylactic reactions. One cannot adopt the philosophy that prescribing them "can't hurt, and might do some good." Additionally, the practitioner has the obligation to prescribe responsibly so as not to contribute to the development of resistant strains of bacteria. The dentist must possess a firm grasp of the indications of antibiotic therapy as well as know which one to prescribe. A thorough review of the microbiology of oral infections is beyond the scope and intent of this article. What I hope to do is to present a brief discussion of current knowledge in the area to provide the practical information needed to make an informed choice.

Past studies usually implicated alpha hemolytic streptococci as the microorganisms most commonly isolated from infected root canals, with gamma strep and enterococci also present, as well as other bacteria in smaller proportions.[1] These results were due to the aerobic incubation techniques used which ignored anaerobic species such as Bacteroides (now called Prevotella and Porphyromonas). The other portion of the former orthodoxy was that periapical lesions do not support microbial growth and are therefore usually sterile; periapical rarefactions do not represent "infection," only "inflammation."[2]

All this has changed. Modern anaerobic culture techniques have revealed that the great majority of microbes in necrotic root canals are strict anaerobes.[3] Similarly, the same culture techniques along with electron microscopy have demonstrated that most periapical lesions are infected with bacteria.[4,5] Anaerobes are contained in the normal oral flora. They become opportunistic invaders where there is either a compromised blood supply or an antecedent aerobic infection, which creates a reduced oxygen environment. Infected sites thus harbor a complex flora consisting of both aerobic and anaerobic bacteria.

In recent years, investigators have realized that anaerobes play an important role in causing inflammation and pain. Many studies have shown the predominance of these bacteria in both necrotic root canals and in periapical lesions. Anaerobes are capable of producing clinical symptoms through the induction of various inflammatory mediators. Several studies have demonstrated the association between anaerobic bacteria and pain, foul odor, and the formation of sinus tracts.[6] Anaerobic infections usually produce tissue necrosis with abscess formation. The patient often develops swelling and experiences pain and fever.

How does this knowledge aid us clinically? If the patient comes in with pain and swelling due to a tooth with a necrotic pulp, there is a good chance that there is an anaerobic component to the infection. If you open the tooth and a foul odor is emitted, the diagnosis is fairly certain. What is the treatment of choice? Thorough debridement, which means the closer to completing the cleansing and shaping, the lower the likelihood that the patient will be back on sick call the next day.

If a periapical radiolucency is noted on the radiograph, indicating that the patient is suffering from a phoenix abscess, there is most likely a periapical extension of the infection, which implies that the tooth should be apically trephinated, that is, instrument through the apex (size 15 to 25 file). Otherwise, a nidus of necrotic, infected tissue must be left in the apical millimeter or so that was not debrided. Additionally, the patent apex will allow drainage to reduce the concentration of microorganisms in the periapical tissue, reduce the fluid pressure and resultant pain, and introduce oxygen to disturb the anaerobic ecology.

What about antibiotics? First, realize that the first line offense should be to open the tooth and debride it, and drain the abscess either through the tooth, externally, or both. Second, determine the severity of the infection. If the patient is experiencing trismus,

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fever, or chills, or is suffering from weakness, dizziness, rapid respiration, or increasing cellulitis, then antibiotics may be indicated. Third, evaluate host defenses. If the patient is immunocompromised, is a transplant recipient, or has poorly controlled diabetes, he may require antibiotics. A patient with one of these conditions, who is having systemic signs and symptoms from dental disease, should have an anaerobic culture taken in case of failure of the empirically chosen antibiotic. Normally, however, pain caused by pulpitis or trauma, small and localized abscesses, and nonvital teeth with draining sinus tracts do NOT require antibiotics. Fourth, be sure to follow-up all cases. A positive response to antibiotic therapy should be seen in 48 hours. Continue the medication at least 3 days after the symptoms are gone.

Specifically which antibiotics should be used? Despite our increased knowledge of the anaerobic flora involved in odontogenic infections, Penicillin VK remains the drug of choice. This is because the spectrum of Penicillin VK includes not only Gram+ aerobes, but also Gram+ anaerobes and, to a lesser degree, Gram- anaerobes. Additionally, anaerobes are never found alone, only in mixed infections. It is likely that many of the symbiotic facultative bacteria will be susceptible to penicillin. Their eradication will deprive the resistant anaerobes of the nutrients they require to survive, destroying the ecology of the infection.

Penicillin is an extremely effective bactericidal antibiotic, with almost complete lack of toxicity. It is also very inexpensive, making it an ideal first line drug. The only drawback to the use of penicillin is that some 3% to 5% of the population is allergic to it. Although few life threatening reactions have been attributed to oral administration, you will nonetheless encounter a significant number of patients for whom a substitute drug is advisable. Some *Porphyromonas* species are capable of producing beta-lactamase, or penicillinase. For these bacteria, clavulanate added to amoxicillin, available as Augmentin®, is suggested.

The cephalosporins may offer somewhat better bone penetration than penicillin, but there is no significant spectrum advantage until at least the late second-generations drugs such as cefuroxime. However, the high cost of this drug, coupled with the 5% to 10% cross sensitivity with penicillin, make it a questionable choice as a replacement.

Erythromycin, an automatic substitute for penicillin in allergic patients, may not be the best choice. It displays reasonable efficacy in uncomplicated cases of mild to moderate odontogenic infection. However, it is a bacteriostatic drug rather than bactericidal, and its spectrum is much narrower than penicillin, with no activity against anaerobic flora. In addition, it causes gastrointestinal upset in many patients, so compliance may be poor.

Clindamycin is an excellent drug for treating serious or resistant odontogenic infection. It should follow as the second drug of choice for infections resistant to penicillin. It has excellent efficacy against Gram+ aerobes and anaerobes. The drawback of clindamycin therapy is the concern for the development of colitis, due to the overgrowth of *Clostridium difficile* that can occur in the 5% of the population that harbors this microorganism. Patients with preexisting lower bowel disease, recent treatment with broad-spectrum antibiotics, recent instrumentation of the lower bowel, or recent hospitalization probably are not candidates for this drug.

Metronidazole is a bactericidal antibiotic with an exclusively anaerobic spectrum that can be combined with Penicillin VK if a resistant anaerobe is suspected. It should not be used in pregnant women or patients with active seizure disorders, and should not be taken in conjunction with alcohol since it can cause an "Antabuse"-type reaction.

When considering a drug, first determine whether the need for an antibiotic exists. If a patient presents with a toothache, an antibiotic is not going to substitute for time spent at the chair opening the tooth. Analgesics are a better choice, but mechanical debridement and/or surgical intervention is the indicated treatment. If the patient has systemic symptoms, whether or not to prescribe antibiotics depends on the effectiveness of local treatment (whether or not drainage is achieved), the patient's medical history, and how sick he actually is. If an antibiotic is chosen, it should be one with a good Gram+ and - anaerobic spectrum as well as a Gram+ aerobic one. The choices are relatively few, and will depend primarily on the patient's medical history.

Above all, be sure to include follow-up in your instructions to the patient. Timely intervention in a patient who is going downhill can mean the difference between life and death. Remember, you are part of the largest dental care system in the world — you are not alone. Do not hesitate to refer a patient about whom you have questions.

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Medical Surveillance in Vietnam: Meeting the Challenge

LTC Robert S. Driscoll†

When the deployments of U.S. Army Special Forces units to Vietnam began, either as advisors to Civilian Irregular Defense Group forces, or with so-called "Mike" and "Mobile Guerrilla" forces (indigenous units recruited, trained, and commanded by U.S. Army Special Forces troops) many challenges presented themselves regarding how to stay healthy in the harsh tropical environment of Southeast Asia.

Knowledge of the principle diseases endemic, and ecologic factors in Vietnam responsible for disease was needed for essential planning of preventive medicine measures for troops. Such medical technical information was not available in sufficient detail for the areas in which U.S. Forces were going to be committed. There was a growing realization that very little medical information was available concerning tropical diseases, especially in critical tactical and strategic areas. The mission was clear; medical surveillance on indigenous disease in Vietnam was needed. However, this type of surveillance would be hampered by the inability to collect specimens throughout the country because of Vietcong control. In order to accomplish this task, a unique special team was developed from medical Special Forces personnel known as the U.S. Army Special Forces - Walter Reed Army Institute of Research (WRAIR) Field Epidemiological Survey Team (FEST) (Airborne).

This article describes the FEST from its beginning to inactivation. It also identified the accomplishments and contributions to medical science achieved by team personnel that justifies the existance.

The FEST concept was organized in May 1965 from the insight and diligence of LTC (later COL) (Dr) Llewellyn J. Legters, U.S. Army, while assigned as a preventive medicine officer at the John F. Kennedy Center for Special Warfare (JFKCSW), Fort Bragg. He recognized that the traditional focus of medical disease research had been on the collection of data from hospitalized patients. He also noted certain important epidemiological phenomena may not be confidently inferred only from examinations of hospitalized patients. He felt the best way to collect data was with a specially trained and multidisciplined research team who would collect empirical data on disease in a field environment before troops became ill.

His goal was to operate the FEST in enemy controlled terrain and remote areas of Vietnam. Their mission was epidemic intelligence collection: to conduct field epidemiological study of disease of major importance to U.S. forces, and stage field trials of preventive medicine measures. Due to this austere mission and area of operations, COL Legters believed the FEST must be self-sufficient and no burden to the line commander. The best qualified personnel were Special Forces trained medical officers and enlisted personnel who could enter an area undetected and study the transmission of disease.

The concept of having medical Special Forces trained personnel conduct field research was initially not favorably received by the Army Medical Department. It was a unconventional idea to clinically-oriented medical professionals. Undaunted, COL Legters made numerous office calls on high ranking medical officers to gain their support. Eventually, he found support from COL (later BG) (Dr) William D. Tigertt, Director, WRAIR. COL Legters believed he "received the support of COL Tigertt because of his own covert medical epidemiological work into North Korea during the Korean War." [1] At the JFKCSW, COL Legters received the Special Forces support from LTG William P. Yarborough, the Center's Commanding General and LTC Richard Coppedge, Center Surgeon.

After receiving the support needed from WRAIR and JFKCSW, the team was formed at Fort Bragg. As the recruitment process began, according to COL Legters, "it was common knowledge on Smoke Bomb Hill (a section of Fort Bragg) that the team was being formed and people just walked in and volunteered." [2]

Each prospective team member had to undergo, or have already completed airborne training, and depending on their background, qualify in Special Forces skills (Q Course), and volunteer for Vietnam. In addition to Special Forces training and Vietnamese language training at Fort Bragg, team members were then field qualified in their respective biomedical

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research discipline. This biomedical training was unique, since no program of instruction had been developed to date. To accomplish this training, a countless series of lectures, laboratory sessions, and other practical training were provided by civilian scientists in the disciplines of public health, research, and infectious disease. Each session was specifically devoted to real or suspected disease problems that might be encountered in Vietnam. To complement their training, individual team members traveled to several other medical centers in the U.S. for further individualized medical training.

Depending on the individual's background, it took 5 to 9 months of training to develop the necessary professional and Special Forces skills required before becoming a team member. This resulting combination of biomedical research and Special Forces skills allowed the Army to conduct epidemiological surveys of military importance in Vietnam that were critically needed.

The FEST consisted of 25 men (9 officers, 16 enlisted) organized into three sections (Figure 1). The Headquarters Section was responsible for normal command and control, supply, and administration. The Clinical Sections, each with one officer and one enlisted soldier, were responsible for entering an area to confirm the presence of disease. Once the presence of disease was confirmed in a geographical area of operations, the issue of occurrence and susceptibility to U.S. forces was pursued. Epidemiological surveys were conducted by the Field Survey Section to gather more empirical data that would be used to state the military significance of disease in the area. This facilitated the identification and correct prophylactic immunizations to counter the disease threat.

Once training was completed, the team deployed to Vietnam, in September 1966, where they received administration and logistic support from the WRAIR country team, but were attached to 5th Special Forces Group (Abn).

The FEST members operated as small teams out of Special Forces camps from Khe Sanh in the northern area to Ha Tien in the south. In country, they collected epidemic intelligence in remote areas and field epidemiological studies of disease of major importance to U.S. forces in malaria, plague, schistosomiasis and intestinal parasitism, febrile illnesses, tropical sprue, pneumonia, and other human and veterinary conditions. They identified the principal causes of medical noneffectiveness among indigenous troops. This aided in the preventive medical protection for U.S. forces as well as indigenous forces. One of the more significant intelligence discoveries of the FEST was made in late 1967. Previous epidemiological studies in South Vietnam identified two strains of malaria of which the indigenous population had built a natural titer. When the population began to display symptoms of malaria, FEST members drew blood samples and identified the strain of malaria as being only in North Vietnam. With this discovery, COL Legters informed the MACV J-2 (Intel) that medical evidence suggested North Vietnamese were in South Vietnam retransmitting the disease from mosquitos biting them and then biting South Vietnamese, thus infecting them with the new strain. The J-2 did not concur that disease transmission was a viable intelligence source. Two months after the discovery, the Tet offensive began, solidifying COL Legter's hypothesis. Other FEST activities included the development of new and modified field survey equipment, such as the portable microscope equipment

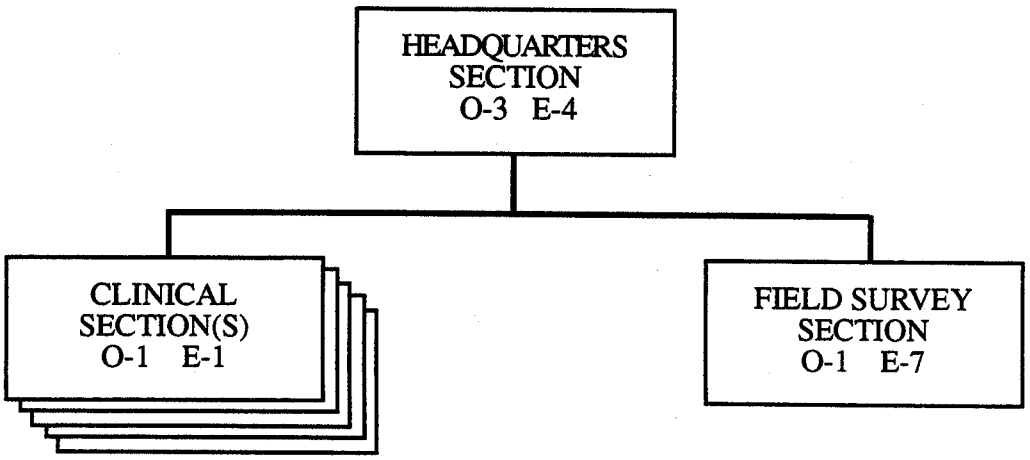

Fig 1. Table of Distribution and Allowances

set, mosquito trapping devices, and data collection devices compatible with then-current electronic data processing equipment.

In addition to the medical data collection, FEST members would accompany Special Forces A-Teams on combat patrols into enemy-held territory. Here, they distinguished themselves as soldiers, as demonstrated at the battle of Dak To, where three Silver Stars and six Bronze Stars for valor were given to FEST members.

Colonel Legters not only initially saw the need for the team in 1965, he also recognized the need to extend the FEST deployment. In September 1966, COL Legters wrote to COL Tigertt that a larger team (Figure 2) of 41 personnel with an expanded mission, flexibility, and sufficient depth in certain key specialties would be needed.

He also recommended that current team members return to the U.S. for refresher training to maintain their status and skills as Special Forces personnel. They would then be returned to missions in Vietnam, or to other parts of the world as deemed necessary.

Because of the need to ensure trained and experienced personnel were on hand to transition the replacement FEST personnel, COL Legters also felt it was important to identify current FEST members in Vietnam who would volunteer to extend their tours.

The studies of the FEST continued through 1968 and diminished thereafter as the war became conventionalized.[3] At this point, the FEST was inactivated in 1968, and team members reassigned.

Today, FEST lineage remains. The distinctive unit flash (originally approved by the U.S. Army Institute of Heraldry in June 1967) for wear on the green beret, as well as a background oval for the parachutist badge, was again approved by the Institute of Heraldry on 29 January 1988 for use by Company F, (training of SFODA medical specialist, 18D) 3d Battalion (Airborne), Academy Brigade, U.S. Army Academy of Health Sciences. The flash and background oval incorporated the colors of both 5th Special Forces Group and WRAIR. Imposed over the black background of the 5th Special Forces Group flash was a maroon diagonal stripe with white piping representing the traditional colors of the Army Medical Department.[4]

In summary, it can be said that the FEST performed exceptionally well as elite field researchers.

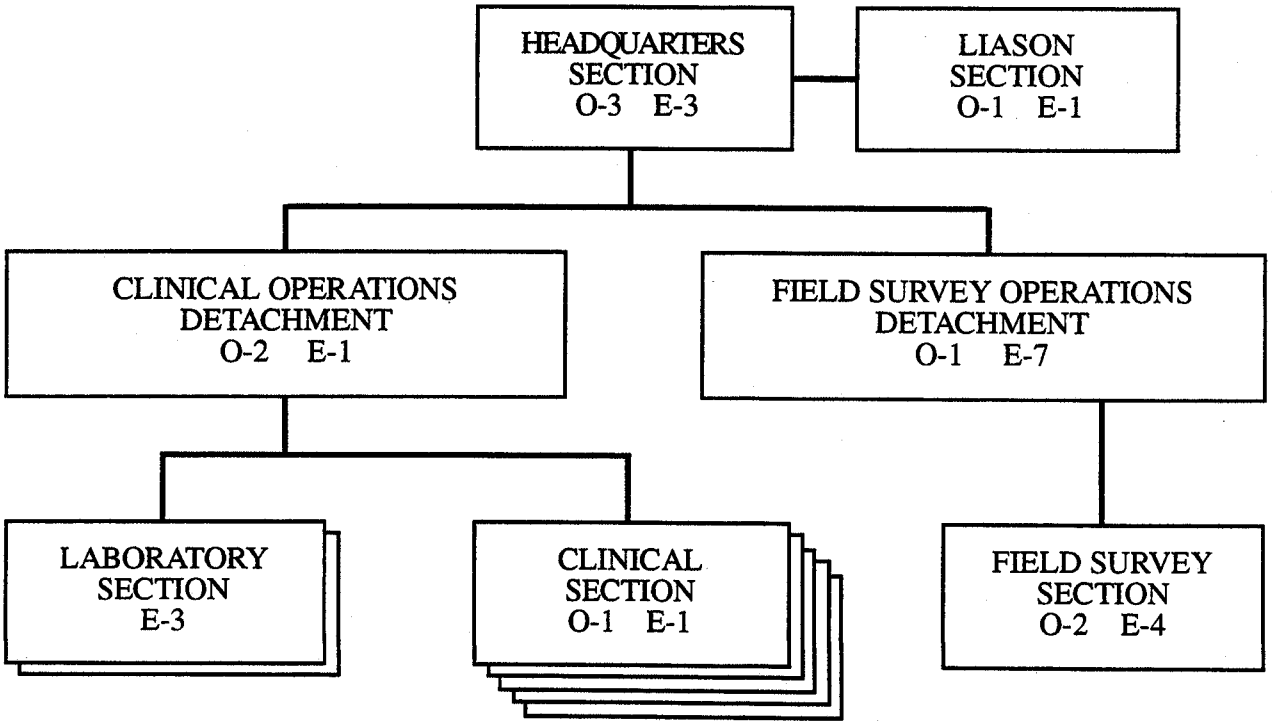

Fig 2.Proposed Table of Organization and Equipment

The team's Green Beret qualification gave them the ability to accomplish medical research undetected in enemy controlled areas. With the pride of being a "Green Beret," FEST members could enter a Special Forces A-Camp, and be accepted as a member of an elite group of soldiers. The FEST proved that a team of medical specialists with Special Forces military training was able to perform a unique and important field epidemiological research mission under hostile circumstances. Studies generated by the FEST provided valuable scientific information concerning malaria, plague, schistosomiasis, filariasis, and tropical sprue that continues today to benefit U.S. Forces deployed around the world.

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AMEDD Dateline

Dr Wayne R. Austerman†

1 Jan	United States Army Institute of Dental Research established at Walter Reed Army Medical Center. **(1962)**
6 Jan	United States Army Dental School established at Walter Reed Army Hospital. **(1922)**
11 Jan	Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army established by order of The Surgeon General. **(1941)**
14 Jan	Schock Hall, Medical Field Service School, Fort Sam Houston, TX, named in honor of COL John D. Schock, DC, who died while a prisoner of Japanese forces in 1945. **(1955)**
16 Jan	The enduring problem of alcohol abuse in the American military results in tragedy when two drunken Union sailors stumble into the magazine of newly-captured Confederate Fort Fisher, NC, while carrying torches. The resulting explosion of 13,000 pounds of gunpowder kills or injures 91 men. **(1865)**
27 Jan	First contingent of Army nurses comes ashore at the embattled Anzio beachhead on the western coast of Italy. Six of them are killed by enemy bombing or shellfire within the next 3 weeks. **(1944)**
6 Feb	King Charles II of England dies of kidney failure and high blood pressure brought on by a severe case of gout. During the preceding week, his 12 attending court physicians had administered to him such medications as quinine, rock salt, linseed oil, violet petals, hellebore root, white wine/nutmeg, and a mixture of milk and ground bone powder derived from the skull of a man who had met a violent death. The last medication was regarded as a potent curative in such cases. **(1685)**
11 Feb	Advanced postgraduate clinical education begins in the AMEDD with the commencement of a series of residency programs in medical and surgical specialties in Army hospitals. **(1946)**
13 Feb	Doctor Oliver Wendell Holmes surprises the Boston Society for Medical Improvement by advocating that surgeons wash their hands in a chloride of lime solution before and after examining maternity patients for puerperal infections. Holmes' proposal met with widespread ridicule and hostility, prompting him to remark that "medical logic does not appear to be taught or practiced in our schools." **(1843)**
15 Feb	Newly-arrived senior nurse Florence Nightingale clashes with Dr John Hall, commander of the British Army Hospital in the Crimea. A veteran military surgeon who bitterly opposed the introduction of female nurses, Hall also scorned the use of anesthetics, claiming that "the smart of the knife is a powerful stimulant, and it is better to hear a man bawl lustily than to see him sink silently into his grave." **(1855)**

† Dr Austerman is the Historian, U.S. Army Medical Department Center and School, Fort Sam Houston, TX.

28 Feb

An invading French Army led by Odet de Lautrec laid siege to the city of Naples, only to meet with defeat from disease. Epidemic typhus scourged the French, killing de Lautrec and over 14,000 of his 28,000-man force within 30 days. Eventually the French Army was reduced to 4,000 troops, while an estimated 50,000 local civilians also died of the louse-borne disease. Abandoning the siege and retreating north toward France, the invaders were pursued and annihilated before they could escape. **(1528)**

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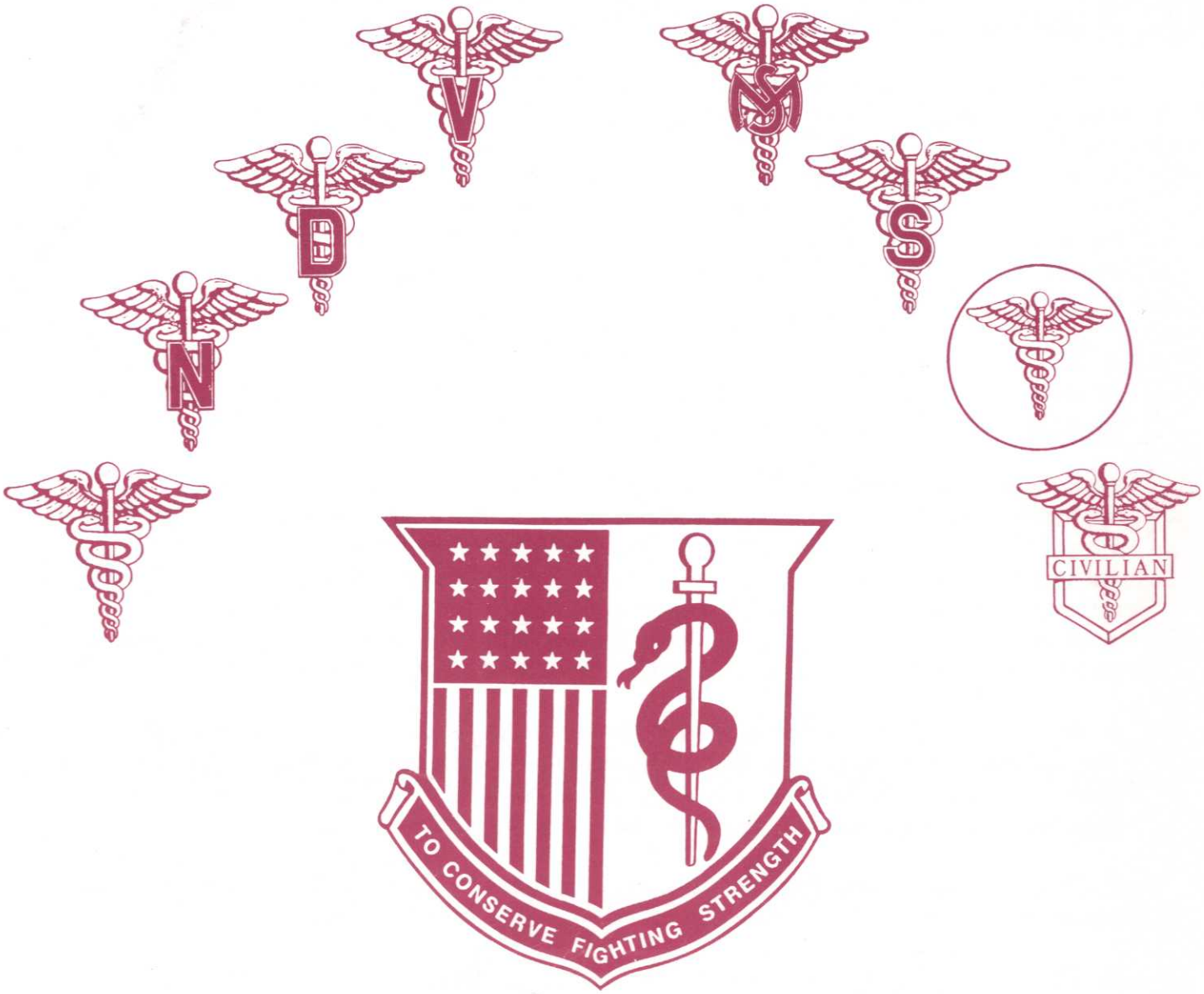

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